

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

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CONTENTS

	PAGE
Editorial Comment:	
Off to M'wanza ..	195
First Flight of the "Scipio" ..	197
Navarro "Chief" ..	198
A New Training Machine ..	201
Guild of Air Pilots ..	201
Private Flying and Club News ..	202
Gliding ..	203
Air Service Training Ltd. ..	204
Airport News ..	205
Air Transport ..	206
Airships from the Four Winds ..	209
Irving Air Chute ..	211
In Parliament ..	213
Rustless Steels: By Dr. W. H. Hatfield ..	214
Royal Air Force ..	216
Royal Aeronautical Society and Inst. Ae.E. ..	216

EDITORIAL COMMENT



ON Saturday last, the first stage of the African airway was opened, without ostentation or ceremony. An "Argosy" took off from Croydon, as Argosies frequently do, and that was all that there was to see. Perhaps it was just as well. Not a few aeronautical journalists have painful recollections of getting out of bed in the very small hours of a very cold day one December, and wending a chilly way to Croydon, to see the Air Minister of the day, open the India airway by flying in person to Delhi. Yet, as some all-important details of diplomatic negotiations with Persia had not been previously straightened out, it was many months before one was able to send a letter by air to India. So far as we can see, it may be likewise some time before we are able to send a letter by air to Capetown.

Those who make a habit of frequenting civil aerodromes have reached a state of philosophic resignation when an event is late in starting. It is what they have come to expect. It is different, of course, when the Royal Air Force takes charge. Punctuality is worshipped in all the fighting services, and not least in the youngest of the three. The events at the Hendon Display are timed in minutes, and the programme is always adhered to. When the annual flight by Royal Air Force machines to the Cape takes place, they very rarely fail to keep up to the schedule.

Civil flying in the main seems to disregard time, although the saving of time is its chief recommendation. We know well that Imperial Airways fully realise the importance of keeping to the timetable. Their ideal is no whit inferior to that of the great railway companies and steamship lines. But the matter does not always rest with Imperial Airways. They cannot maintain a service regularly unless they possess the necessary aircraft. They may order these in good time, but they do not always receive them with promptitude. So the case-hardened aerodrome lizard merely shrugs his shoulders and mutters "as usual."

Imperial Airways have two obligations. They have to be regularly replacing their existing fleet with more

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

- 1931
- Mar. 7 Sailplane Club and Model Aircraft Club Joint Dance at Suffolk Galleries
 - Mar. 12 "Night Air Mails" Lecture, by Capt. C. Florman, before R. Ae. C., 6.30 p.m.
 - Mar. 12 "Metals," Lecture, by W. J. Norton, before Westland Aircraft Soc.
 - Mar. 14 Opening of British Empire Trade Exhibition, Buenos Aires.
 - Mar. 14 Association Football: R.A.F. v. Army.
 - Mar. 14 No. 10 Sqdn. R.F.C. and R.A.F. Reunion Dinner at Ye Old Pindar of Wakefield, Grays Inn Road.
 - Mar. 19 "Research in the Berlin Technische Hochschule," Lecture, by Dr. W. Hoff, before R.Ae.S.
 - Mar. 19 "Care and Maintenance of Engines," Lecture, by K. Smith before R.Ae.S. (Glos. and Chelt.).
 - Mar. 25 R.Ae.C. Annual General Meeting.
 - Mar. 27 "Flying of High Speed Seaplanes," Lecture, by Sqdn.-Ldr. A. H. Orlebar, before R.Ae.S., Hull.
 - Mar. 28 Association Football: R.A.F. v. R.N. & R.M., Millwall.
 - Mar. 28 Rugby Football: R.A.F. v. Army at Twickenham, 3p.m.
 - April 7 Air League Children's Fete, Hanworth Air Park.
 - April 11-19 National Aircraft Show, Detroit, U.S.A.
 - April 16 "Aircraft Noise," Lecture, by Dr. A. H. Davis, before R.Ae.S.
 - April 22 Air League Annual Dinner at Dorchester House, Park Lane.
 - April 27 Closing date of British Empire Trade Exhibition, Buenos Aires.
 - April 30 "Aerodynamics of Sails," Lecture, by Dr. M. Curry, before R.Ae.S.
 - May 14 "Metal-Clad Airship," Lecture, by C. Fritzsche, before R.Ae.S.
 - May 15-31 Stockholm Aero Show.
 - June 6. Newcastle Ae.C. Meeting at Cramlington
 - June 27 Royal Air Force Display, Hendon
 - July 8-11 Blackpool International Meeting.
 - Aug. 22 Newcastle-on-Tyne Meeting.

efficient types, and they have to be continually extending their services. To carry out both these functions simultaneously means placing orders well ahead for new types, and ordering quantities before the first machine of the type has been tried out. This plan worked well in the case of the "Argosy." As designers accumulate more and more experience in the production of aircraft, it becomes more and more reasonable—in fact inevitable—to pursue this plan of ordering machines in bulk without waiting for tests of the type. If this could not now be done with reasonable expectation of all going well, we should feel that aeronautical progress was an unjustifiable expression. None the less, sometimes results do not come up to expectations, and then the operating company finds a great difficulty in carrying out its undertakings up to time. We imagine that Imperial Airways are in such a position at the present moment, and that they will need all their ingenuity to complete the African airway, while still maintaining the regularity of the India airway, without a delay which the public may regard as undue.

Three new types of aircraft have been ordered by Imperial Airways for their Empire services. The increase of numbers was needed when the second airway had to be added to the first. On the first, namely, from Croydon to Karachi, the time seemed ripe for introducing new and more commodious machines. The well-tried types which have been working on the Karachi route are still amply good enough to open the service to Capetown. So the three older "Argosies," the three "Calcuttas," and the four "Hercules" machines were allocated to the Cairo-Capetown service. The three new types ordered are the Handley Page type 42, eight of which were ordered, three Short "Kent" flying boats (four Jupiters), and the Armstrong Whitworth monoplane. Of the last-named not much is known at present. We cannot tell when it will be ready for use, and as for the number ordered, we can only quote a statement issued by the Armstrong Whitworth firm which speaks of a "fleet" of these machines.

The first of the three "Kents" has already been flown satisfactorily, and there is no reason to doubt that all three will be handed over to Imperial Airways in good time. They will take over the crossing of the Mediterranean, releasing the three "Calcuttas" for the section Khartum-Kisumu. In the meantime, these "Calcuttas" have to be responsible for the Mediterranean crossing and also for the journey down the Nile and Lake Victoria to M'wanza. This leaves a very small margin for eventualities, and

we sincerely hope that none will occur. We have great faith in the "Calcutta," and believe that with due care in operation and maintenance all will be well.

The position in regard to landplanes is not so satisfactory. As we have said, the three older "Argosies" have been sent to Cairo. The change to geared Jaguars has very much improved their performance, we understand, and they should be ample to keep the service going between Cairo and Khartum. This involves two days of flying, 470 miles from Cairo to Aswan, and 645 from Aswan to Khartum. These machines have been replaced on the European service by a newer type of "Argosy," which, however, was only intended for the normal European services of Imperial Airways. The first stage of the Empire airways, namely, from Croydon to Salonika, had been allocated to the Handley Page 42. The Eastern model of the same machine is to take over the India service from Cairo to Karachi, which is now operated by four "Hercules" machines. These four are needed to complete the southern stage of the Africa airway, from Kisumu to Capetown. This stage involves over four days of flying, and for that a fleet of four machines does not seem excessive. But in any case, the India line cannot be denuded of aircraft, and so until the Handley Pages are available to go on to that service, it appears that Imperial Airways will not be able to drive further south than M'wanza on Lake Victoria.

The trouble is that "Hannibal," the first of the batch of eight H.P. 42 machines, has not yet successfully completed its test flights. This is distinctly unfortunate for all concerned. We have no precise knowledge of what the trouble is, or of how long a time is likely to be occupied in rectifying that trouble. All the eight are well forward, so that when a solution has been found for the troubles of the first, the whole batch should be ready to fly without much further delay. We can only hope that everything will soon be put right.

Until all these eight machines are in service, Imperial Airways are short of seating capacity for a potential 304 passengers. Probably such a capacity will not be urgently needed for some little time. It is rather the shortage of eight machines which is likely to cause embarrassment to the operating company. Until this deficiency is made good, it is hard to see how the service right down to Capetown can be put into operation, and in the meantime a service to Tanganyika is not very impressive or likely to be very remunerative.



The King's Levée

His Majesty the King held a Levée at St. James's Palace on March 3, at which the following were amongst those present:—Air Marshal Sir E. Ellington (Principal Air Aide-de-Camp), Group Capt. E. D. M. Robertson, Wing Commander Louis Greig, Lieut. de Vaisseau Sala (French Air Attaché), Lt.-Col. P. F. Bitossi (Italian Air Attaché), and Capt. V. Mariashevitch (Naval and Air Attaché for Yugoslavia). Amongst those presented to His Majesty the King were:—Flt.-Lieut. J. Adams, Flying Officer J. Baker, Group Capt. A. Barratt, C.M.G., M.C., Flying Officer R. Beaton, Flying Officer G. Calvert, Sqdn.-Ldr. W. Caster, M.C., the Rev. S. Clarke, Chaplain-in-Chief, R.A.F., Flt.-Lieut. C. Coaker, Sqdn.-Ldr. F. Coleman, D.S.O., Flying Officer H. Dawes, Flying Officer P. Fair, Sqdn.-Ldr. W. Farrington, D.S.O., Flt.-Lieut. H. Hodder, Flt.-Lieut. E. Hopkins, Flying Officer W. Hutton, Flt.-Lieut. J. Kirby, Wing Commander R. Marix, D.S.O., Flying Officer C. McLoughlin, Flying Officer J. Mynors, Flt.-Lieut. F. O'Han-

lon, Flt.-Lieut. F. Perry, Flt.-Lieut. N. Pritchett, Wing Commander G. Roberts, M.C., Group Capt. E. Robertson, D.F.C., A.D.C., Flt.-Lieut. H. Pearson-Rogers, Wing Commander W. Ryan, C.B.E., Sqdn.-Ldr. A. Barr-Sim, Group Capt. J. Tyssen, M.C., Sqdn.-Ldr. W. Waller, A.F.C., Flt.-Lieut. A. Willets, etc.

The Princes' South American Tour

On February 27 the Prince of Wales and Prince George, who flew from Santiago to Valparaiso in a Sikorsky amphibian on February 28, flew back in the same machine, and after taking farewell to President Ibanez, left by train for Osorno, *en route* for Buenos Aires, where they were expected to arrive on March 5.

H.M. aircraft-carrier *Eagle* and H.M. destroyer *Achilles* arrived at Puerto Belgrano on February 25. Eighteen aeroplanes took off from the *Eagle* and landed at the Sarmiento air station nearby, whence they flew next day to El Palomar, the air station near Buenos Aires. They returned a few days later to Puerto Belgrano.

A KENT SUNSET



THE FIRST FLIGHT OF THE "SCPIO": Rarely has a first test flight inspired such confidence as did Mr. Lankester Parker's on the first of the Short "Kent" class, built for Imperial Airways. There was no question of short "straights." Mr. Parker took the machine off and flew it at once as if it had been an old type, and it appeared to answer the controls perfectly. (FLIGHT Photo.)



THE NAVARRO "CHIEF"

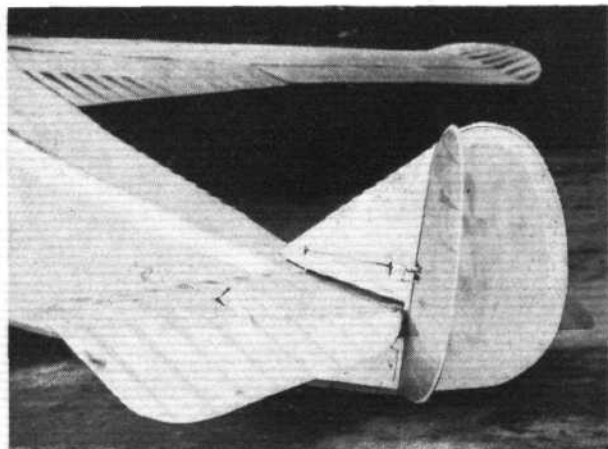
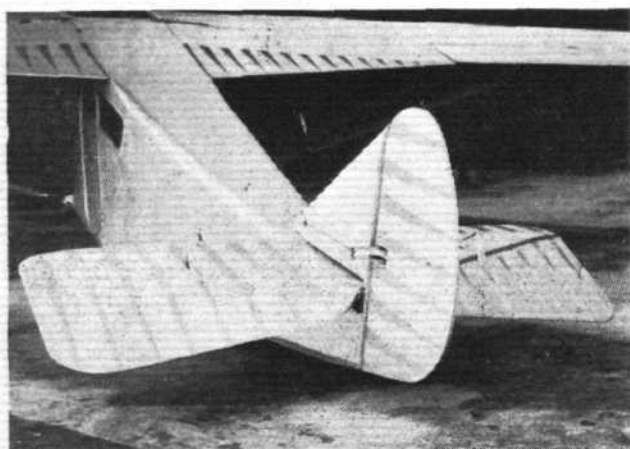
A Low-Power Three-Engined Monoplane Three-Seater

WHAT is probably the smallest three-engined aeroplane in the world has just been completed at Heston by Navarro Safety Aircraft, Limited. Known as the Navarro "Chief," the new machine is a three-seater fitted with three A.B.C. "Scorpion" engines. In addition, the aerodynamic design is unusual in that it incorporates a number of features which the designer, Mr. J. G. Navarro, believes will make the new machine immune from most of the evils to which aircraft are subjected, such as stalling, spinning and sideslipping. Whether all these claims will be realised, remains to be seen. At any rate, Mr. Navarro has made a determined attempt to "go one better," and has not remained content to follow the beaten track.

The aerodynamic features by which Mr. Navarro hopes to avoid stalling, spinning and sideslipping may possibly be seen most readily in the general arrangement drawings on the next page. To take spinning first, it will be noted that the elevator flaps are hinged along axes which make an angle with the transverse axis of the machine. Mr. Navarro's theory is that, in a manoeuvre like the spin, the air



THE NAVARRO "CHIEF": Side and three-quarter rear views. (Flight Photos.)

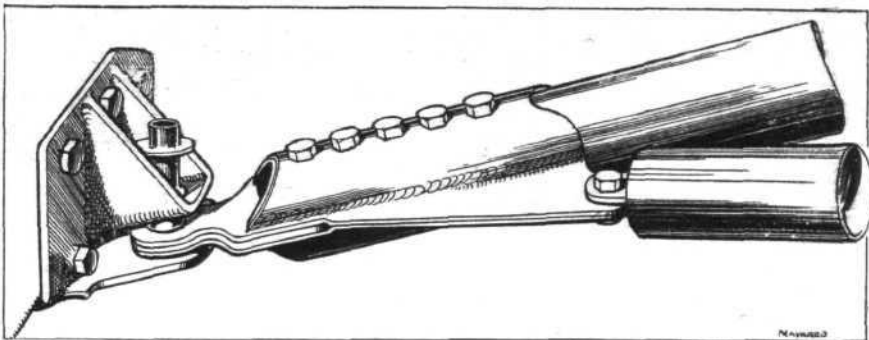


THE AIR BRAKE: The "split" rudder acts as an air brake. It is here shown in the closed and open positions. (Flight Photos.)

would be striking one elevator flap practically "edge on," and the other at a large angle, and that this would prevent the machine from continuing the spin. It is a little difficult to see the theoretical justification for Mr. Navarro's claim, but as the machine will be flying shortly, the proof of the pudding should soon be available.

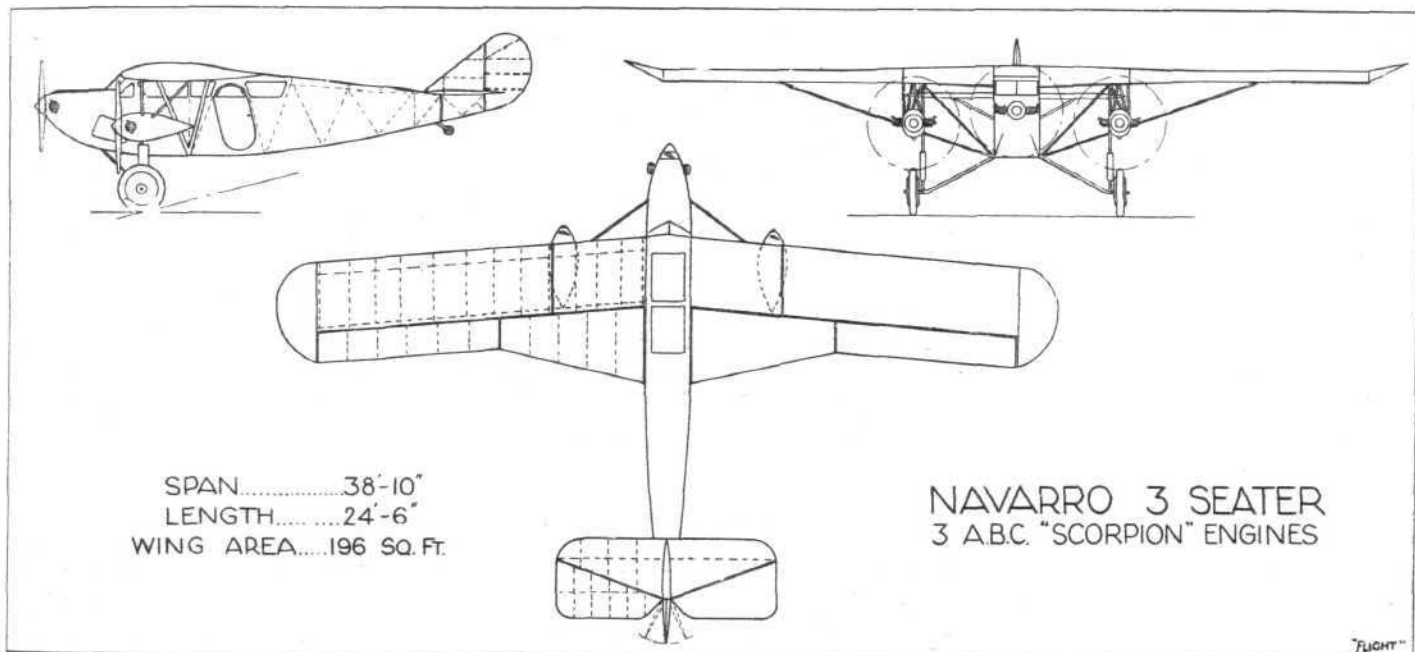
The non-sideslip characteristics of the machine Mr. Navarro hopes to attain by the use of up-tilted wing tips. These, it will be recalled, are used on the fixed wings of the latest "Autogiro" machines, and so are less experimental in character than the diagonally-hinged elevator flaps. The non-stalling qualities of the machine Mr. Navarro hopes to obtain mainly by the plan form of his wing, in conjunction with an elevator of somewhat unusual section.

Finally, an air brake is fitted in the Navarro "Chief" which, although not entirely original, has not been seen on an aircraft since the early days of flying. This takes the form of a "split" rudder, the two halves of which lie close together in normal flight, but open like a book when used



THE NAVARRO "CHIEF": Attachment of wing-bracing Vee struts to lower corner of fuselage. (FLIGHT Sketch.)

"Chief" is not without unorthodox features, but even if all the designer's hopes are not realised, the machine should be none the worse off for the use of these unusual ideas, as the general behaviour can, presumably, be tried out without adding to the risk. For example, the "split" rudder need not



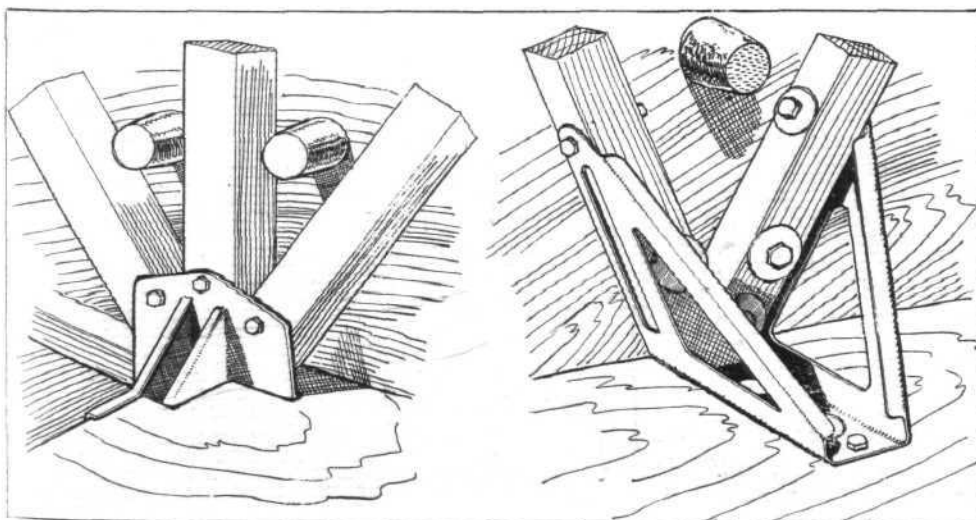
as an air brake. A very similar principle was experimentally tried many years ago, on, if we are not mistaken, a Bleriot monoplane of the "Cross-Channel" type. What success, if any, attended this arrangement we do not recollect.

From what has been said, it will be clear that the Navarro

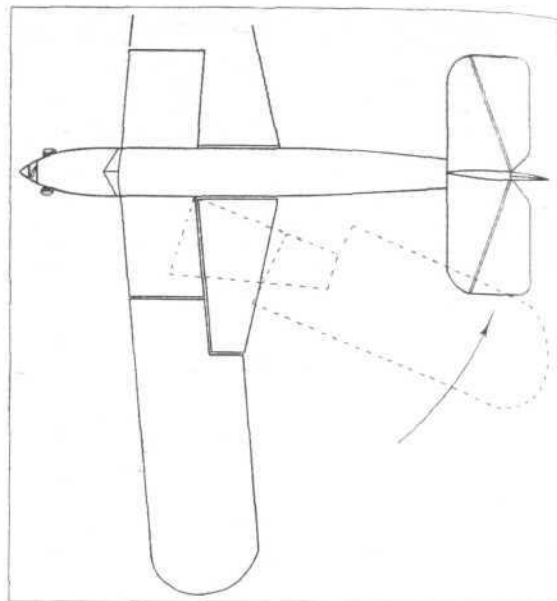
be used until the machine has been otherwise tried, while the diagonal elevator hinge could hardly cause trouble, even should it fail to do what is expected of it in the matter of preventing spinning.

Regarded as an ordinary aeroplane, and leaving on one side all the experimental features introduced in the design, the Navarro "Chief" might form a serviceable type for certain kinds of work. The use of three engines must, of necessity, reduce the aerodynamic efficiency and so the "Chief" can scarcely be expected to be, for instance, as fast as a single-engined type of the same weight and power. But if the three-engined power plant arrangement results in a marked improvement in immunity from forced landings, the sacrifice of a few miles per hour might well be tolerated for certain classes of flying.

It would also seem that a three-engined machine, whatever its engines, must be more expensive to produce than a single-engined type of the same power and seating capacity. Maintenance is likely to be more expensive, as there are three engines to look after, with three separate engine installations. Thus one cannot help thinking that in this small size the



TWO INTERNAL FUSELAGE DETAILS: On the left the internal fitting in way of lift strut attachment, and on the right a typical fuselage bracing bracket. The pillars projecting inwards from the fuselage walls are of cork, and are intended to deaden noise. (FLIGHT Sketches.)



THE WING FOLDING ARRANGEMENT OF THE NAVARRO "CHIEF": On the left a photograph of the port wing folded, and on the right a diagram of the folding scheme. (FLIGHT Illustrations.)

application of the three-engined principle will not result in a machine called for in a general way. That is not to say that the type will not have its uses. In certain circumstances, the avoidance of forced landings may be absolutely imperative, and if the Navarro "Chief" proves to be able to maintain its height on any two engines, it may be worth its extra cost and maintenance.

Constructionally, the "Chief" is a straightforward aircraft in most respects, with a fuselage built of wood, with plywood planking, and wings having wooden spars and ribs and a fabric covering.

The fuselage is of the flat-sided type, with rounded corners. The forward part carries the mounting for the central engine, and behind that comes the cabin, with the three seats arranged one behind the other, the pilot occupying the front seat.

A windscreen in front, and windows in the sides of the cabin give light and view, the deck fairing in front of the forward seat being dropped to enable the pilot to look forward over the central engine.

The monoplane wing is of orthodox construction, in wood with fabric covering. The wing folding arrangement is rather clever. Had the hinge been placed on the rear spar, just behind the outboard engine, the folded width would have been increased by the wing chord on each side, and folding would hardly have been worth while. Mr. Navarro then devised the scheme of hinging the wing where the rear spar joins the fuselage, the wing structure being completed by a false rear spar over the inner length, so that when the wing is folded rigidity is maintained by the main rear spar, which runs through from root hinge to wing tip, and by the outer portion front spar, with the Vee wing-bracing struts. In this way the folded width of the machine is kept down to the actual width over engine mountings. The trailing edge inner portion folds upwards.

The three A.B.C. "Scorpion" engines are mounted one in the nose and the other two outboard under the wing. Petrol is carried in the short wing roots which remain in place when the wing is folded, and this location of the tanks gives direct gravity feed to all three engines. The two wing engines are enclosed in streamline cowls, and the central engine is also cowed in except for its cylinder heads.

The undercarriage is of the "split" type, with radius rods

and bent axles hinged to the lower longerons of the fuselage, and the telescopic legs going to the wing engine mountings. The telescopic legs, by the way, are of the type used on the Avro 504, with one single and one double strut carrying cross heads over which the elastic is stretched. The wheels are ready for the fitting of brakes, but brakes have not actually been incorporated yet, some of the undercarriage fittings being barely strong enough to take the brake loads, and requiring to be modified before the brakes are actually used.

The Navarro "Chief" was designed for a tare weight of 1,050 lb., and a gross weight of 1,800 lb., but as so often happens the first machine has exceeded the calculated weight somewhat. Mr. Navarro is, however, confident that in the production machine the extra weight can be saved and the full estimated load carried.

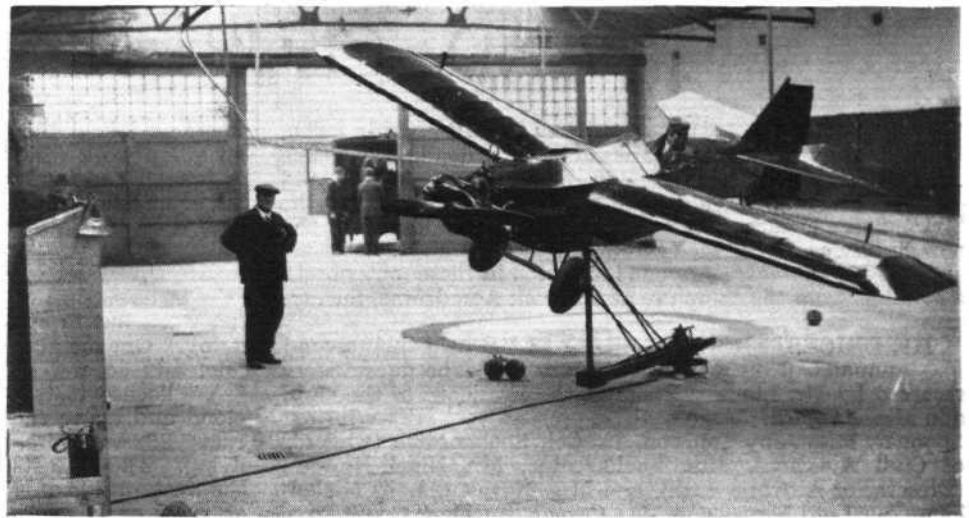
It is expected that the "Chief" will make its test flights quite soon. Further particulars may be obtained from Navarro Safety Aircraft, Limited, Heston Air Park, Hounslow, Middlesex. The telephone number is Hayes 410, Extension 39.



TWO OF THE THREE ENGINES: Note also the undercarriage with mudguards over the wheels. When the wing is folded the point of the fairing of the outboard engine moves back with the wing bracing strut. (FLIGHT Photo.)

A NEW TRAINING MACHINE

THE "Whitlet" Hoverplane.—Has been built by the W. L. Hoverplane Syndicate, 68, Castle Street, Farnham, as a machine for giving people primary instruction in flying. It is in effect a more or less straightforward power-driven aeroplane sitting on a vertical pivot rising out of a horizontal arm which is free to rotate around another pivot on the floor. The slipstream from the propeller appears to work on the rudder and to a certain extent on the elevators, but these are augmented by a weight which the action of the stick moves up and down the fuselage, and the lateral control is entirely maintained by the same method, for in this case the ailerons do not move at all. It is possible that a pupil would get some idea of the effects of flying by sitting in such a machine, but we think that the "feel" of the controls will have to be altered considerably before this is comparable to the real thing. It is also unfortunate that the designers should have put the throttle on the starboard side of the fuselage and made the ignition switch to work in the same manner as an ordinary electric light switch, both of which are contrary to general aircraft practice. On Friday last, February 27, we witnessed a demonstration by Mr. D. Martin and Mr. J. R. Whiting. There is a system of electric



lights which can be operated from a sort of control box outside the aircraft, and by which, it is claimed, the pupil can be directed to take-off or land, etc. It seems quite possible that the idea, though somewhat crude now, can be developed for teaching pupils something of the effect of aeroplane controls in a cheap manner, and there is a still further application in it for use in amusement parks. We understand that this latter is being investigated and a special model produced.

GUILD OF AIR PILOTS

ALTHOUGH very young in years of existence, the Guild of Air Pilots and Air Navigators of the British Empire are very ancient in their ideas of running their Institution upon well-tried lines. By following the traditions of the great City of London guilds, subject to the special requirements applicable to the air element, the Guild Council is well advised in their determination to ensure their body being set upon a sound foundation. Recognised by all the existing aeronautical organisations, the Guild promises to be one of the most valuable assets available for the future of aviation. It was therefore suggestive that the new Civil Aviation Air Chief—Lt.-Col. Shelmerdine—was their guest of honour at the Royal Aero Club on Monday evening at a "family" dinner, when the members and their guests, in renewing in many instances, old friendships, offered him their welcome and congratulations upon the important post to which he has been appointed.

Capt. Lamplugh, who occupied the chair, said it was the first occasion of the Guild entertaining guests, and he welcomed Col. Shelmerdine, who was well known to all of them. He had, he was afraid, a difficult task before him, with a surfeit of problems to face. The members of the Guild, however, knew his power and had the greatest faith in him and his ability to overcome all the difficulties of his job. Col. Shelmerdine, he continued, could rely upon the most loyal support of every member of the Guild.

Mr. L. A. Wingfield, the Clerk to the Guild, having followed with a short résumé of the work and ambitions of the Guild—Col. Shelmerdine felt much gratification at his reception as the first guest to be honoured. He felt that he was undertaking a vast responsibility in having to follow so amazing a personality as the late Sir Sefton Brancker. He realised the difficulties, but he would endeavour to be worthy of his job. In conclusion, he said that the way in which he was receiving the support of all the aeronautical bodies gave him great gratification to get on with the work before him.

The toast of "The Guests" having been happily proposed

by Mr. Wingfield, Mr. Handley Page accepted the task of replying. Unlike his usual highly humorous remarks, Mr. Page opened in quite a serious mood by drawing comparisons between the Guild and previous epoch-making pioneers of the sea, etc. The efforts of these ancient adventurers at the time, no doubt, were regarded as very small happenings, but with the centuries which had since passed, they were now regarded as the corner-stones of the great structures which had since been built up. He prophesied that in like manner the Guild of Air Pilots would in the days to come be so regarded. In conclusion, he paid tribute to Col. Shelmerdine and the very difficult task before him, and called for the whole-hearted support for the new Civil Air Chief from all and every one interested in the well-being of the future of aviation.

Mr. E. C. Gordon England, in proposing "The Guild," said, although he claimed to be mainly associated with, perhaps, the youngest of the air interests—viz., gliding—he admired the principles upon which the Guild had been launched and he was amongst those who admired the adherence to the splendid old customs, such as the Loving Cup, and he was glad to know that already the Guild had such a cup presented to them. He wished the greatest prosperity to the Guild.

Sir Alan Cobham, in reply, remarked upon the fact that every one then present had been associated directly and intimately with aviation for from 10 to over 20 years, and he was glad to be able, on behalf of the Guild, to welcome their guests that evening.

The toast of "The Chairman" was proposed by Comdr. Perrin, Capt. Lamplugh briefly offering his thanks; this brought a delightful "family" reunion to a close.

Amongst others present were: Lord Herbert Scott, Maj. Petre, Maj. Jones, Maj. Digby, Sqdn.-Ldr. de Haga Haig, Capt. Cordes, Capt. Hope, Capt. Birkett, Comdr. Perrin, Messrs. G. E. Woods Humphery, A. S. Wilcockson, C. G. Grey, A. N. Davis, Stanley Spooner, C. A. Pike, Walters, Drury, O. P. Jones.

The Air Estimates

ACCORDING to *The Times*, it is understood that the air estimates for the coming year will show an increase of about £800,000 despite the urgent appeal which has been made by the Chancellor of the Exchequer to the heads of the

defence services for a reduction in their expenditure in the coming year. Most of the increase in the case of the air estimates is due to the normal development of aviation services, to the provision of new material, and to the more general use of metal machines.

PRIVATE FLYING AND CLUB NEWS

HOME COUNTIES AIRCRAFT SERVICES, LTD., have arranged a series of lectures dealing with such subjects as navigation, meteorology, engines and rigging, having regard to their application to the "B" pilot's licence. These will be held in the lounge of the new club-house at Gatwick aerodrome by Capt. F. H. Robinson and Mr. M. Thomas. Anyone interested in these may obtain a syllabus from the company at Gatwick Aerodrome, Surrey.

THE LEICESTERSHIRE AERO CLUB held their second annual ball on Friday, February 27. The guests were received by Mr. Lindsay Everard, the President of the club, and Mrs. Everard. Among those present were Miss Winifred Spooner, Miss Amy Johnson, Lt.-Col. Shelmerdine (Director of Civil Aviation), Mrs. Shelmerdine, Mr. Nigel Norman (Director of Airwork, Ltd.), and Mrs. Norman, Lord Michelham, the Lord Mayor and Mrs. Carver, Kathleen Countess of Drogheda, Sir Julian and Lady Cahn, Lady Patricia Moore, and a very large number of keen supporters of the club. Col. and Mrs. Shelmerdine, who were brought up from Stag Lane in Mr. Everard's "Puss Moth," by Miss Winifred Spooner whom, we understand, has taken on the post of his private pilot in succession to Mr. Stewart David. The ball, which was attended by 300 guests, was held at the King's Hall, Leicester, and a touch of novelty was introduced by erecting the Comper "Swift," on which Flt.-Lt. Comper had flown over from Hooton, in the vestibule of the Grand Hotel.

HANWORTH CLUB have just issued an interesting little booklet, describing all phases of activity of the club, and together with this is an exceptionally useful leaflet with a map of the recommended routes for those travelling from the club to London by road, and also the times of trains, both to and from Feltham, and the times of the various 'bus services. This book really gives all the information which anyone can want to know about Hanworth or N.F.S. in general, and any readers who are interested can obtain a copy by writing direct to Hanworth Club, Feltham, and mentioning FLIGHT.

THE HAMPSHIRE AERO-PLANE CLUB at Hamble witnessed something new, interesting, and even amusing on February 19 and 26, when several Autogiros gave a display of formation flying. On the 19th there were for a short time actually five in the air at the same time, piloted by Señor Don Juan de la Cierva, Mr. Rawson and Mr. Bree, of the Cierva Company, and Mr. Dudley and Mr. Marsh, instructors of the Hampshire Club. Cinematograph operators worked both from the ground and from a light aeroplane in flight, and, no doubt, we shall see this unique formation on the screen as part of the Paramount News shortly. On the 26th there were only four in the air, and Mr. H. T. Andrews replaced Señor de la Cierva.

BROOKLANDS FLYING SCHOOL have, on account of very bad weather during the month of February, been unable to do a large amount of flying. They were, however, able to put in 80 hrs., which is not so bad, taking into account the weather and season. The school's Cirrus Moths are gradually being replaced by those fitted with Gipsy engines and two of these are already in commission. Mr. E. Slade

has now joined the school as an instructor. The new construction work which is being carried out at the aerodrome is going ahead fast and the school will shortly be moving into larger quarters which will include both improved hangar and club accommodation.

CINQUE PORTS FLYING CLUB were somewhat hindered by snow during the middle part of the week ending February 21, but in spite of this were able to get in 16 hours' flying. One member—Mr. E. W. Kennett, of Deal—was sent solo, and several other members are now ready for their "A" licence tests. They had to contend with much low cloud and many snow storms during the week ending February 28, but were, in spite of this, able to do 18 hr. 50 min. flying. The club itself is being moved from the eastern to the western side of No. 1 hangar, and the builders are already at work on the new premises, which will include dressing-rooms, lounge, pantry, bar and workshops. This will be a much better position, as it will provide a pleasant outlook over the country to the west from the windows and will allow members to get some sun instead of gazing at the back of the power-house buildings. The number of private owners' aircraft housed there has so greatly increased that the whole of the western side of the hangar has been leased from the Air Ministry instead of only a portion, as before.



UNDER THE SHADOW OF THY WING. Flt.-Lt. Comper, Miss Johnson, Mr. Everard, Miss Spooner, and Mr. Franklin, beneath the "Swift" at Leicester

THE ABERDEEN AERO CLUB will now, it is hoped, shortly be able to start flying activities. They have obtained a field at Dyce, near Aberdeen, and work upon the ground has already been started. The necessary funds have been obtained, and there is every hope that they will have their own machine by the time the field is ready.

THE NOTTINGHAM FLYING CLUB have the honour of passing for their "A" licences a couple who must be unique in the history of flying. These are the Rev. John Pyddoke, rector of Peasley, Nottinghamshire, and his wife, who took their licences the same day. Mr. Pyddoke is 61 and his wife 52. The occasion was in the nature of the celebration of their silver wedding, and they have been training at Tollerton for the past eighteen months. The annual meeting of the club was held at the aerodrome, on Thursday, February 26, when it was disclosed that there were 71 members and 4 honorary members. During the past year, 685 hr. 25 min. had been flown and 16 "A" licences issued, making the total number of qualified pilots belonging to the club, 31.

SURREY FLYING SERVICES have been teaching quite a number of people to fly recently, and the latest of these to be sent solo by Mr. "Timber" Woods is Miss Maisie Proctor. She made two exceptionally good landings, and we are told promises to make a very able pilot. She recently tried one of the Henderson Flying School Moths with Capt. Muir of Surrey Flying Services, and this gave rise to the rumour that she had transferred her allegiance from the latter school. This is not, however, the case, and she has throughout received her instruction from them, for the most part on their Avian.

GLIDING

BRADFORD GLIDING CLUB showed great enthusiasm, for their constructional section under Mr. Crosland, worked all night in order to repair their glider ready for the competitions at Harrogate on Sunday, February 22, and their enthusiasm was well repaid, as their team were the first winners of the cup, competing against Harrogate, Leeds, and Ilkley. Their total distance of 1,449 yards was made up of the following glides: H. Jones, 291 yards; A. M. Verrity, 279 yards; N. H. Sharpe, 269 yards; W. C. Sharpe, 290 yards; S. Woodhead, 177 yards; H. Hastwell, 143 yards. The "Airedale" training glider, which we mentioned recently, has been designed for ease of assembly with improved performance and low cost. The main plane is so constructed that the two halves may be assembled on the ground complete with cabane and landing wires, and can then be lifted straight on to the fuselage. The fuselage itself is designed so that any part may be replaced easily if broken. The rudder and elevators are interchangeable, and the ailerons are more effective than is generally the case. The brief specification is as follows: length, 17 ft. 9 in.; height, 6 ft. 7 in.; span, 32 ft.; chord, 5 ft.; wing area, including ailerons, 160 sq. ft.; rudder area, 7 sq. ft.; elevator area, 14 sq. ft.; aspect to run, 6.4-1; weight empty, 168 lb.; gliding angle, 16 to 1; landing speed, 10 to 14 m.p.h.

SOUTH ESSEX AERO CLUB have not been able to do very much gliding during the past two months owing to unfavourable weather conditions. Work is, however, proceeding on a new hangar, and a ground of nearly 300 acres has been obtained at Langdon Hills, Laindon, Essex. Those interested in the club should apply to the Hon. Secretary, 41, Hall Road, Chadwell Heath.

THE AIRCRAFT CLUB, Harrogate, took part in the competition organised by them on Sunday, February 22. Bradford, as we have announced elsewhere, were the winners, with a total distance for their team of six members of 1,449 yards. Ilkley were second with 1,218 yards, while one of their members, Mr. J. Allen, achieved the longest individual distance of 334 yards. Leeds were third with 1,194 yards, and Harrogate fourth with 1,073 yards. They were, unfortunately, one pilot short.

THE STOCKPORT GLIDING CLUB has been making good progress recently, in spite of the exceptionally bad weather conditions during the last few weeks. They have been trying the German "high launch" method, but have not found it very successful owing to the heavy nature of the ground. Unfortunately, their ground is on the level, and some other method will have to be tried.

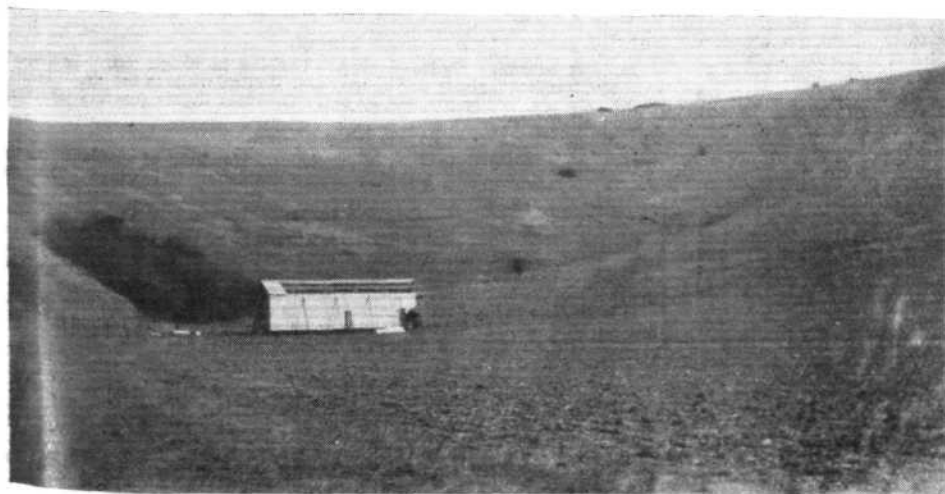


The New Zealand built Dickson Glider at Wanganui.

THE DICKSON GLIDER in New Zealand.—Messrs. Smaller, Chew and Pendreigh have recently completed a Dickson glider at Wanganui, New Zealand, the plans of which readers will know were published in FLIGHT, and full working drawings of which may be obtained from this office at 30s. net. This New Zealand-built model has been a great success, and Capt. L. H. Brake has made an extended series of test flights at South Beach with it, both with the elastic rope launching method and after being towed behind a car.

THE LONDON GLIDING CLUB concentrated their energies on assembling their new hangar last week. This building is 50 ft. by 30 ft., with full-width opening doors, which will make it unnecessary to dismantle and reassemble their gliders. They have had an addition to the group of private owners in the person of Mr. Allan, who has recently purchased the "Scud," built by the Brant Aircraft Co., Ltd., of Croydon, this makes the total number 5, as Mr. Beardmore owns a "Professor," Capt. Needham his "Albatross," Mr. Bradbrooke a "Dickson," and Mr. Lander a "Prüfling." The annual general meeting was held in the library of the Royal Aeronautical Society on Wednesday, February 25, and disclosed the fact that the balance sheet showed a profit on the year's working of £254 8s. The following officers were elected:—Chairman, Mr. J. R. Ashwell-Cooke; Hon. Sec. and Treasurer, Mr. H. A. Abdallah; Vice-Chairman and Club Captain, Mr. Marcus Manton; Committee: Messrs. Buxton, Culver, Grice, Hiscox, Needham, Humby, McCulloch, Morland and Petre.

THE SAILPLANE CLUB have now nearly completed their new hangar, and it is hoped that this will be in use on Sunday, March 8. Those who are attending the club dance on Saturday, March 7, should note that no money can be taken at the door or the Suffolk Galleries, and that tickets at 2s. 6d. each, for the dance only (refreshment buffet extra), should be obtained from the Hon. Sec., E. G. Smettem, 2, Wine Office Court, Fleet Street, E.C.4. Spot prizes will be given, and music is provided by Mr. Harry Gentle and his Band. A series of photographs will show the activities of the Sailplane club, and the Model Aircraft Club will have some models on view. The subscription for the Sailplane Club has been fixed at £3 3s. for 1931.



The New Hangar of the Sailplane Club at Small Dole, Sussex.

AIR SERVICE TRAINING, LTD.

THE following is the schedule of the courses which have been arranged by Air Service Training, Ltd., at Hamble, the company which, as was announced in FLIGHT for last week, has recently been formed, with Air Marshal Sir John Higgins and Mr. J. D. Siddeley among the directors. It will be seen that this is a very comprehensive schedule. Messing and sleeping accommoda-

tion will be available at Hamble, and the charges will compare favourably with those of an R.A.F. Mess. The Commandant of the School is Grp. Capt. R. J. F. Barton, O.B.E., while Flt./Lt. H. F. Jenkins is the Chief Instructor. The charges for the courses include all lectures, insurance of aircraft and third-party risks, but do not include books, meals, housing or travelling expenses.

COURSE FOR "AB INITIO" SERVICE PUPILS

DURATION OF COURSE—Twelve Weeks. Types of Aircraft used for Course—Avro Tutor, Atlas, Siskin.

This course covers a complete flying training on elementary and Service type aircraft, and is similar to the training of an R.A.F. pilot. The following is the sequence:—

Passenger flying. Taxi-ing and handling of engine. Effect of controls with and without engine (including aileron drag). Straight and level flying. Stalling, climbing and gliding. Taking off into wind. Landing and judging distance. Medium turns. Gliding turns. Steep turns with and without engine. Spinning. Elementary forced landings. Low flying (with instructor). Solo. Climbing turns. Side-slipping. Action in the event of fire. Taking-off and landing crosswind. Advanced forced landings. Aerobatics. Front seat flying. Air pilotage. Forced-landing test. Height test. Cross-country test. Passenger test.

Pupils will receive advanced dual after each 2½ hr. solo or more often if necessary, on both elementary and Service type aircraft.

Particular attention will be given to:—Forced landings. Low flying. Aerobatics. Cross-country flying. Cloud flying.

Aircraft are equipped with parachutes which will be worn by pupils on all flights.

Approximately 180 hr. are spent in the workshops and lecture rooms where the following subjects are fully dealt with.

Engines (Time allotted—70 hr.)

Explanation of various parts. Theory of four-stroke cycle. Metals used. Cooling systems. Petrol systems. Elementary carburation and altitude control. Lubrication systems. Elementary electricity and magnetism and how the magneto works. Ignition systems. Care and running of an engine. Running faults—how to diagnose and remedy. Engine instruments. Tuning an engine. Detailed instruction in the "Jaguar" engine, to include:—General construction, assembly, care and maintenance, dismantling and inspection. Revision.

Rigging (Time allotted—70 hr.)

Aeronautical terms used in rigging. Explanation of parts of an aeroplane and the loads to which they are subjected. Materials used in aircraft construction and why. General particulars and description of Avro Tutor. Probable effects of bad landing and subsequent examination. Parts of Avro Tutor in detail:—Construction, assembly, truing-up, checking; this to include fuselage, tail unit, undercarriage, centre section, main planes and controls. Effect of various parts being out of truth. Causes and methods of correction. Splicing, wire bending and fabric work. Locking up and inspection. Types, construction and examination of aircrews. General particulars and description of atlas. Parts of atlas in detail: Construction, assembly, truing-up, checking. Effect of various parts of atlas being out of truth. Causes and methods of correction. Revision.

Air pilotage (Time allotted—30 hr.)

Definitions. Maps and Charts. Earth's magnetism: application of variation and deviation. Plotting a course on maps and charts. Construction and functions of a magnetic compass. Description and use of air pilotage instruments. Triangle of velocities. Application of triangle of velocities and C.D.C. in finding courses to steer. Coefficients A, B and C. Testing compass for serviceability, and faults to be expected. The period of a compass. The meaning of aperiodic and when a compass must be tested or swung. Compass swinging in the lecture room, using deviascope. Practical swinging on a compass base. Revision.

Theory of Flight (Time allotted—10 hr.)

Aerodynamic forces. Level flight. Turning. Taking off and landing. Stability. Control and arrangement of surfaces. Aerobatics and Spinning. Revision.

Meteorology (Time allotted—10 hr.)

Weather charts. Pressure, temperature and humidity of the atmosphere. Winds. Fog, mist and haze. Cloud forms. Precipitation. Depression and anticyclones. Line squalls and thunderstorms. Revision.

Airmanship (Time allotted—20 hr.)

Meaning of airmanship and general regulations relating to flying. Rule of the road in the air, aerodrome rules, local regulations, marking of obstructions. Pilots' log books. Parachutes. Use, care and maintenance, fitting, packing and inspection. Tarmac discipline, starting aero engines. Inspection and maintenance of aircraft and engines. Forced landings, procedure before and after. Pegging out an aeroplane—practical. Flying in hot countries and at high altitudes. Revision.

Note.—Weekly tests will be given in each of the above subjects to ensure that a pupil's progress is up to standard.

An approximate idea of the flying time necessary may be gained from the following schedule:—

Avro Tutor, dual	10 hr.	£80	Service Type, dual	4 hr.	£48
Avro Tutor, solo	10 "	80	Service Type, solo	10 "	120
Avro Tutor, advanced dual	1½ "	12	Service type, advanced dual	1½ "	18
					Total
					37 hr. 358

The school has made arrangements with the Air Ministry for parties of pupils, accompanied by an instructor, to visit R.A.F. units and aircraft firms. Pupils will be required to meet the cost of their own travelling and accommodation expenses.

At the end of the course, an examination will be held, and suitable certificates will be issued to successful pupils.

COMMERCIAL PILOT'S COURSE

DURATION OF COURSE—Approximately three weeks. Type of Aircraft used for Course—Avro Tutor.

This Course is intended for the experienced pilot who is about to embark upon flying "for hire or reward."

Flying.

Complete Blind Flying Course as described. Fog and bad weather flying in open cockpit. Out and In and triangular cross-country courses. Forced Landings. Map Reading. Low Flying (with instructor).

Ground Subjects.

Air Pilotage. Meteorology. Airmanship. Morse. Upkeep and care and maintenance of aircraft and engines. Wireless communication between commercial aircraft and ground stations. Maps and Charts (plotting courses, etc.). International Air Conventions, including all subjects which will enable a pupil to obtain a "B" Licence.

Complete Blind Flying Course	£80
Dual instruction for remainder of Syllabus—10 hours flying	£80
Total	£160

The above fee includes all instruction in ground subjects.

Night Flying.

Instructions in Night Flying will be given on an Avro Tutor as required at £10 per hour, dual and solo.

COMBINED "AB INITIO" AND BLIND FLYING COURSE

DURATION OF COURSE—Fourteen Weeks. Types of Aircraft used for Course—Avro Tutor, Atlas, Siskin.

In addition to the ground covered for the "ab initio" pupils' course, a complete Blind Flying Course is included.

The following will show the approximate time necessary for a pupil of average ability:—

Elementary Training		Advanced Training	
Avro Tutor, dual (10 hr.)	£80	Service type, dual (4 hr.)	£48
Avro Tutor, solo (10 hr.)	£80	Service type, solo (10 hr.)	£120
Avro Tutor, advanced dual (1½ hr.)	£12	Service type, advanced dual (1½ hr.)	£18
Blind Flying		Total, 46½ hr.	
Avro Tutor, under hood, dual (9½ hr.)	£76		£434

COURSE FOR PRIVATE PILOTS

DURATION OF COURSE.—Three weeks. Type of Aircraft used for Course—Avro Avian.

The instruction given includes the following:—Methods of forced landing. Aerobatics—including careful tuition in spinning. Cloud Flying, and Cross-country flying. Theory of Flight. Air Pilotage. Meteorology. Airmanship. Care and Maintenance of Engines. Care and Maintenance of Aircraft.

Rules as to lights, signals, and air traffic. International air legislation. On completion of the course a pupil should be in a position to maintain his own aircraft.

The schedule below will give an approximate idea of the times necessary for a pupil of average ability:—

Light land type aeroplane	8 hours dual	£48
Light land type aeroplane	6 hours solo	£36
Advanced dual	½ hour	£3
Total	14½ hours	£87

The above fees include instruction in ground subjects.

Night Flying.

Night Flying has not been included in the above Syllabus, but instruction can be obtained at the School. It is recommended, however, that pupils should complete a minimum of twenty hours' solo flying before taking their course of night flying instruction.

The fees for Night Flying on the Avro Avian are £7 per hour dual and solo.

SEAPLANE COURSE FOR SERVICE OR CIVILIAN PILOTS

DURATION OF COURSE—Approximately three weeks. Types of Aircraft used for Course—Avro, Avian, Avro Tutor, Atlas.

This Course is designed to meet the requirements of the pilot who has some solo experience on a land type aircraft.

Flying.

Taxi-ing control. Hydro-planing. Taxi-ing in rough sea. Taking-off, calm sea, rough sea, glassy and choppy sea. Control while in the air. Alighting—ordinary sea, heavy sea, glassy sea. Overseas flights (marine pilotage). Forced alightings.

Airmanship at Sea.

Inspection and maintenance of seaplanes. Handling of seaplanes on the water. Launching and bringing ashore seaplanes. Moorings. Drogues. Towing.

Ground Instruction.

Charts. Hydrographical publications (light lists, tide tables, tidal stream atlas, nautical almanac). Systems of buoyage (light buoys, beacons). Systems of lights. Visibility (light vessels). Fog Signals (types—audibility). Tides (methods of finding times at high-water). Rule of the road at sea.

It is difficult to lay down a definite fee to cover the cost of the whole course but an approximate idea of this may be gained from the following, which represents the training of a pupil of average ability.

Hydroplane, 5 hours	£30
Avro Avian Seaplane, dual, 3 hours	£24
Avro Avian Seaplane, solo, 3 hours	£24
Total	£78

Or on an Avro Tutor, seaplane, at £12 per hour, or the Atlas Seaplane, at £18 per hour.

The Hydroplane is a seaplane fitted with an aero-engine designed so that it cannot be taken off the water, and its object is to lighten the cost of preliminary training.

COURSE FOR INSTRUCTORS

DURATION OF COURSE—Eight Weeks. Types of Aircraft used for Course—Avro Tutor, Siskin, Atlas.

This course is intended for pilots who have at least 200 hr. flying to their credit, and includes:—Careful training in accurate flying. Analysis of all movements of controls in the air. Methods of forced landing. Aerobatics. Low flying. Comprehensive instruction in modern methods of training, both in the air and on the ground, with ground instruction in:—Lectures on general principles of instruction. Theory of flight. Airmanship. Air pilotage. Engines—construction, care and maintenance. Rigging—construction, care and maintenance of aircraft. Aerodrome and school organisation. Maintenance and construction of flying instruments.

The following gives an idea of the flying time necessary:—

Avro Tutor, dual	7 hours	£56
Avro Tutor, solo	7 "	£56
Siskin, dual	2 "	£24
Atlas, dual	1 hour	£12
Both Service Types, solo	6 hours	£72

Total .. 23 hours .. £220

On occasions, two pupils will be sent up in the same aircraft and in this case the cost of flying will be divided.

Pupils will be categorised and given certificates as follows:—AST—A.1. An exceptional Instructor. AST—A.2. An Instructor above the average. AST—B. An average Instructor. AST—C. An Instructor below the average. AST—D. Unsuitable as an Instructor at present.

BLIND FLYING COURSE

DURATION OF COURSE—Approximately Fourteen Days. Types of Aircraft used for Course—Avro Tutor or Avro Avian.

These machines are fitted with a translucent hood which, when in position, deprives the pupil of external visibility. Thus, the pupil is flying under conditions similar to those encountered in fog or heavy cloud. The instructor occupies the front cockpit which is open.

This course includes the following training under the hood:—Flying straight and level. Climbing and gliding. Turns. Gliding turns. Take-off. Spinning and recovery. Correction of awkward positions created by instructor. Changing course. Straight cross-country flying. Out and in cross-country. Four-point cross-country. Tests.

Ground instruction in Blind Flying will be given with a specially constructed apparatus and lectures delivered on instruments used in the air. On completion of the course, certificates will be issued to pupils who successfully pass the tests.

The following schedule, which is intended for pupils who have flown solo on any type of aircraft, gives an approximate idea of the time necessary for turning out a finished pupil:—

1/2-hr. flying in open cockpit (£8 per hour) ..	4	s.	d.
9 1/2 hr. flying under hood (£8 per hour) ..	76	0	0
Total ..	80	0	0

or at £6 per hr. on an Avro Avian.

AIRPORT NEWS

CROYDON WEEKLY NOTES

THE week has passed with very little of outstanding interest to record. We have sampled nearly every type of weather, and to finish the week off, blinding snowstorms swept the aerodrome all day on Saturday, intermingled with bright periods.

Sunday morning found the aerodrome covered in 6 in. of snow, but this rapidly thawed. However, the flag was kept flying, and the services were well maintained. To those who do not think aircraft are reliable in bad weather, let them just cast their minds back seven or eight years, and they will remember that it was no uncommon thing for services to be suspended for days at a time, owing to bad weather. Today, it is safe to say that there is not one day in the year that some services are not running, or at least attempted.

Lt.-Comdr. Glen Kidston, R.N., returned from Paris early in the week. He did the journey in 1 hr. 45 min. with a head wind, which definitely proves that the machine is decidedly faster than any other aircraft in and out of Croydon. A few fast machines of this nature would undoubtedly prove a paying concern during the summer months.

The inward-bound Argosy G-AACJ, of Imperial Airways, piloted by Mr. Walters, from Cologne, on Monday last, had a thrilling escape. The pilot was flying through a snowstorm, when suddenly there was a blinding flash from one end of the machine to the other. The engineer went into the cabin, which was full of smoke, to see if anything had happened there, and soon found that the wireless set was completely disabled, the back having been blown out. All the fuses had blown, and every valve, both transmitting and receiving, had been broken. The aerial had been burnt off, and what remained of it was fused into other metal parts, as clean as if it had been acetylene-welded. The compass was affected and the whole machine became magnetised. Mr. Walters had to carry on without his wireless and compass, and it was some days before it was possible to swing the compass and put the machine on service again. It was rather a terrifying experience, I should think. Can any of my readers imagine the feelings of Capt. Grace,

of the A.I.D., when that blinding flash took place? He was a passenger! One can recall something similar happening to the late Capt. F. L. Barnard on G-EBMT, a Handley Page W.10, but on this occasion the wireless set was not destroyed.

Imperial Airways have been busy with large parties, booking Argosies for joy-rides, and, no doubt, the summer tea flights will again be very popular. One is very glad

to hear that this company have ordered a fleet of four-engined monoplanes from Armstrong, Whitworth, Ltd., and they are likely to be here quite soon. It will be remembered that details of these machines were published in last week's issue. This is good news, and they will be needed this summer. Imperial Airways is the national company, and, naturally, everyone wants to see them the finest air line in existence. G-EBLE is again on service, and will not be going to Africa yet, I understand. Perhaps "Hannibal" will soon be here, or that Imperial gentleman General Clive!

According to an evening newspaper, Imperial Airways will be moving their headquarters from Airways House to Victoria Station, and will run a ro-railer service to and from Croydon in the near future. I doubt whether this will show any actual saving of time over the present system.

The German and French companies are to run their night-flying services again this year. The Luft-Hansa Co. commence their Croydon-Cologne-Berlin service and vice versa next month, and the Air Union Co. their Croydon-Paris-Croydon services shortly afterwards. The Sabena people continue with their night air mail, Croydon-Brussels-Croydon.

Mention of night flying makes one think that it will be interesting to hear Capt. Carl Florman, managing director of the A.-B. Aerotransport, Stockholm, lecture

on "Night Flying" before the Royal Aeronautical Society on Thursday, March 12.

The traffic figures for the week were: passengers, 316; freight, 32 tons.

P. B.



AN AERIAL LIGHTHOUSE: The Praha Airport of Czechoslovakia possesses an imposing aerial lighthouse, which is shown in the accompanying illustration.

AIR TRANSPORT

AIR UNION DEVELOPMENTS

THIS is the time of year when thoughts of many people turn toward the sun, and all those who can afford it make a journey to the south of France. Even when this is done by one of the fast "de luxe" trains, the journey is long and somewhat tedious and it is not surprising, therefore, that the Air Union Company have found it profitable to institute a service direct from Croydon through to Marseilles. The advantages to be gained through travelling by air on a journey such as this are very many, and it is now possible for anyone to leave the offices of the Air Union at 52, Haymarket, London, at 8 a.m., and to arrive at Monte Carlo one hour after midnight the same day. Such a journey entails nearly seven hours continuous flying and the thought of this may tend to put off prospective travellers. They need, however, have no fear on this score, since the aircraft used, at any rate for the greater part of the journey, are the acme of comfort. As things are at present, it is only possible to fly as far as Marseilles and from thence to Monte Carlo it is necessary to take the train. Even so, the saving is very great indeed. Though the train connection at Marseilles is by no means good and involves a wait there of 2 hr. 40 min. If we disregard the train journey from Marseilles to Monte Carlo, since this is the same whether one arrives from Croydon by air or by train, we find that there is a saving of nearly 14 hr. on the journey to Marseilles alone, and what is even more important the air fare as far as Marseilles is only £9 15s. while the first class train and sleeper fare is £12 13s. 1d.

Before very long the total time and cost will probably be even further reduced, since an aerodrome is being opened at Cannes, and assuming that the flying time from Croydon to Cannes is about the same as that to Marseilles, the total journey to Monte Carlo should then only take about 9 hr. This aerodrome is however not yet opened, but M. Edouard Bret, of the Hotel des Anglais, who is well known as the present owner of Mr. Alan Butler's special King's Cup Moth, and who, on this machine, last year, won the Coupé Zenith, tells us that negotiations for its operation are going through smoothly, and it should be in working order before very long. Incidentally, M. Bret is very keen on everything to do with aviation, and his hotel is fast becoming the centre for all British aviation visitors to Cannes.

To revert however to the route as it stands now, it will be interesting to run through it and see how this rapid journey is accomplished. The prospective passenger foregathers at the Air Union office at 8 a.m., and is transported thence to Croydon by the company's motor coach. At Croydon he leaves by the 8.50 a.m. "Golden Ray" machine. This is of the Lioré et Olivier type with two 500 h.p. Renault engines. It carries 12 passengers at a cruising speed of about 105 m.p.h., and it is the company's boast that they provide the fastest transport of anyone between Croydon and Paris. Paris, Le Bourget aerodrome, is reached at 11.05 a.m. where the

passengers' baggage goes through the Customs before being transferred to the next machine for Marseilles. There is a wait of 25 min. here which allows time for a meal at the restaurant. At 11.30 a.m., the next stage starts for Lyons. This, and the subsequent stage to Marseilles is done in the commercial version of the Breguet XIX. The machines running on this part of the journey are, since they run to the Cote d'Azur, called the "Rapid Azur." These are single-engined sesquiplane machines with a 400-h.p. geared Renault or 600 h.p. Hispano Suiza engine. They are really exceptionally quiet and comfortable machines, and one of the nicest cabin machines we have ever flown in. The noise is certainly no more than the average underground train and it is quite possible to talk to one's companions across the cabin without leaning over or raising one's voice unduly. The machine carries seven passengers besides the two pilots, at a cruising speed of about 115 m.p.h., while the landing speed is quite low. Internally the decoration is pleasantly carried out in blue imitation leather and the seats are exceptionally comfortable, a good point being the very soft head and neck rest at the top, which makes it quite pleasant to go to sleep. Large windows are provided alongside each passenger, with the consequence that everyone can see out of both sides of the machine with great ease. This is a very important point on a trip such as this, as the scenery both between Le Bourget and Lyons and Lyons and Marseilles is extremely beautiful.

The route from Le Bourget goes a little east of Fontainebleau through Montereau, south by Avallon to Macon and thence to Bron, which is the aerodrome for Lyons. This route may of course be changed according to the exigencies of the weather, and it is sometimes found necessary to divert it to the east by Dijon or else to the west nearer the river Loire. Normally one arrives at Bron at 2 p.m. and has a quarter of an hour's wait for refreshments, since unlike the "Golden Ray" machines there is no provision for this on board the "Rapid Azur." Leaving again at 2.15 p.m., the machine goes almost due south down the Rhone valley, and is for a large part of the journey in view of the Alpes du Dauphine. This part of the route is particularly beautiful, as Valence, Orange and Avignon, and such old towns are at their best from the air. Just before reaching Marseilles, Istres aerodrome is passed close on the right-hand side. This is one of the main centres of French aviation training, and the aerodrome is enormous, being about 15 miles in length. This is also interesting at the present moment since the French seaplane station of Etang de Berre is close to this aerodrome, and it is here that the French pilots for the Schneider Trophy are in training. A little further on is Marignane aerodrome which is the aerodrome for Marseilles. It is unfortunate that this is about 25 miles from Marseilles and necessitates a drive of one hour before reaching the Air Union Office, No. 1, Rue Papere. It has, however, been found impossible



Croydon. The Airport of London from which the Air Union and all other air lines from England start.



The "Rapid Azur" ready to start from Lyons-Bron Aerodrome.

to obtain a site nearer than this, and it has, perhaps, its advantages, since being situated as it is on the shores of the Etang de Berre it can also be used for the seaplane services of the Air Union to Ajaccio, Tunis, etc., and those of the Italian Company Navigazione Aerea to Genoa and Rome. The Deutsche Luft Hansa also operates a land service from here to Barcelona and during the summer months both Barcelona and Genoa can be reached from London on the same day by these routes. When one thinks of the time which trains take, a journey such as that by air from Croydon to Monte Carlo seems a very great advance in our methods of transport and had one said a few years ago that before very long it would be possible to breakfast in London, and have a late dinner in Monte Carlo no one would have credited it.

The Air Union Company was founded in 1919 with a temporary service from Paris to Lille, which was organised to carry supplies to the returning inhabitants, since the railway at that time had not been reconstructed and it was only a short time after this that the Paris to London route was instituted, and this has run uninterruptedly ever since. The extension of the line through Lyons to Marseilles was started in the spring of 1926, while at the same time there was a further extension from Lyons to Geneva. The growth of the company's activities has been steady in all directions, both in the number of miles flown and the passengers and goods carried, and the following table gives the figures for the last five years and will well illustrate this.

Year	1926	1927	1928	1929	1930
Miles ..	558,750	765,350	817,625	1,198,850	1,380,000
Passengers	6,426	6,684	10,293	13,293	14,850
Goods ..	202,116	255,000	413,597	706,107	850,297

It is only fair to say that the route right through to Monte Carlo, as we have sketched it, is that which is carried through when weather permits, and since the present time includes the worst flying months of the year, when snow, storms, low clouds and thick fogs are prevalent both in the south of England and between Paris and Lyons, it is hardly surprising if the machines occasionally fail to get through. We are told, however, that this has only been the case twice during the last three months, which reflects very great credit upon the company and their pilots.

Through the courtesy of the Air Union and of Gordon Hotels, Ltd., we were recently enabled to make a trip ourselves, and while it is true we were delayed a little owing to the Mistral blowing at Marseilles, which made it impossible to land there, we were comfortably established in the Hotel Metropole, Monte Carlo, at 7 a.m. on the morning following that on which we left Croydon. This wind does not, however, often reach the force it did during our trip, and as we said before, it is only twice during the last three months that the machines have been unable to get through. The return journey is not quite so convenient, but it still saves a great deal, and obviates much of the discomfort over the railway journey.

It is necessary to leave Monte Carlo by the night train for Marseilles, and, arriving very early in the morning, there is time for a bath and comfortable breakfast before the company's motor coach leaves for the aerodrome at 8 a.m.

The homeward route is, of course, the same, and all being well, one should arrive at Bron at 10.30 a.m., Le Bourget at 1.15 p.m. and Croydon at 3.45 p.m.



The "Golden Ray" landing at Croydon. (FLIGHT Photo.)

AFRICAN AIR ROUTE INAUGURATED

THE first section of the new Empire air route to Cape Town was inaugurated on February 28, by Imperial Airways, when a machine left Croydon at 8.45 a.m. with mails and freight for various parts of Africa. There was no inaugurating ceremony, only Col. W. H. Franklin, Trade Commissioner in East Africa, and Maj. Woods Humphery, Managing Director of Imperial Airways, being present to see the machine off.

Actually, the machine was the usual Armstrong-Whitworth "Argosy" on the England-India service, which, in addition to the African mails, carried a passenger and mail for India, some passengers for Paris, and several officials of Imperial Airways who were journeying to their posts on various portions of the African route.

Altogether, there were fifty bags of mails (about 40,000 letters), of which about 10,000 letters were for Africa—most

of which were probably sent on behalf of air mail collectors! There was, however, about 800 lb. of parcels freight for Tanganyika Territory and various parts of Africa, including the Congo. Some of this freight consisted of voice greetings and other gramophone records.

The "Argosy" is responsible for its cargo over the existing route to Athens, after which a Short "Calcutta" takes over to Alexandria. After a short train journey to Cairo, another "Argosy" carries on as far as Khartoum, and then the rest of the 1,680 miles to Mwanza, Lake Victoria, the present terminus of the route, is accomplished by a Short "Calcutta,"—the first machine arriving there on March 9. Full details as to times and rates have already been published in FLIGHT.

Græco-Roman Agreements with Imperial Airways

THE terms of a new agreement to be concluded between the British and Greek governments about aerial communications were settled at a meeting between M. Zannas, the Greek Air Minister, and Colonel Burchall, of Imperial Airways, and Mr. G. G. Fitzmaurice, of the Foreign Office, on February 26. The agreement provides for various alternative routes across Greece for the British services whereby Imperial Airways will be able to work for a number of years, to be defined later, and provides for eventual Greek services to Malta and Cyprus, if desired. The company will have to pay Customs duties on the petrol and oil consumed by its machines while flying over Greek territory. The difficulties with Italy have also, we believe, been settled recently. It is reported that last year Sig. Mussolini stated he wished the British to fly again over the Italian route, and as a result negotiations, previously opened by the late Sir Sefton Brancker, were resumed between Mr. Bertram and Gen. Balbo. No doubt, therefore, the Indian and African services of Imperial Airways will follow the original Italy-Phaleron-Crete route, instead of via the Balkans, which would offer advantages in many ways.

Berlin-Shanghai Air Route

ON February 23, two Lufthansa aeroplanes and a party of pilots and mechanics arrived at Shanghai from Germany for the purpose of inaugurating the first section of the Berlin Shanghai air route. At first preliminary flights will be made between Shanghai and Manchuli, on the Russo-Manchurian border. It is hoped to extend the service to Berlin, following the Siberian Railway, in April, by which two additional machines will be available. The service at the beginning will be bi-weekly, for mails.

K.L.M. Evening Flights

THIS summer, during May, June, July and August, the K.L.M. will introduce a novel evening service between Croydon and Amsterdam, machines leaving Croydon at 7 p.m., and Amsterdam at 6.30 p.m. The service to the Dutch Indies will, it is stated, be a weekly one by next October, instead of a fortnightly one as at present.

Air Mails for Poland

THE Postmaster-General announces that, according to information now received from the French Post Office, the air mail service from this country for Poland via Paris, which closes at the General Post Office, London, at 2.30 p.m. on weekdays (except Saturday), at present offers no acceleration over the ordinary services for Poland closing at the General Post Office, London, at 6 p.m. The only air mail service between this country and Poland will, therefore, be that which closes at the General Post Office, London, at 6.45 a.m. on weekdays.

Continental Air Mails

THE Postmaster-General announces that as from March 2, in consequence of changes in the time-tables of the air services to Berlin and Rotterdam and Amsterdam, the latest times of posting air mail correspondence at the General Post Office, London, will be 6.45 a.m., instead of 7.45 a.m. for Czechoslovakia, Germany (Hanover and Berlin), Poland, Russia, Scandinavia and the Baltic States, and 11.0 a.m. instead of 8.30 a.m. for Holland. The latest time for posting for the air mail service to the Dutch East Indies, Siam, Straits Settlements and Malay States, will be 11.0 a.m. instead of 8.30 a.m. as from Wednesday, March 4, and every second Wednesday thereafter. The latest time of posting for the air mail service to Cologne will still be 7.45 a.m.

Wiluna Goldfields Air Service

It is reported from Kalgoorlie that the Goldfields Air Navigation have completed arrangements for a regular air service to Wiluna and Esperance. The new development is expected to prove of considerable service to these goldfields. It will be remembered that West Australian Airways

At present, passages may be booked as far as Khartoum, but when the service has been given a trial it will be open for passengers over the whole route. The fares from London will be:—Assiut, £53; Luxor, £55; Aswan, £57; Wadi Halfa, £65; Kareima, £71; Khartoum, £75; Malakal, £85; Juba, £97; Kisumu and Mwanza, £101. The combined postal rate is 7d. for the first ½-oz.

Later on, also, the new machines previously referred to—the Armstrong-Whitworth "A.W. XV," the Handley-Page "42," and the Short "Kent"—will be put into service on their respective sections of the route. Then, in the summer, it is hoped to complete the route to Cape Town. When in full operation the service should be a successful one, with feeder lines serving various parts of Africa.

ran a similar service some time ago, and suspended operations owing to lack of traffic, but suggested that the service could be made a paying proposition when the mines began production.

Sound Beacons for Aircraft

ACCORDING to the *Morning Post*, a wireless "beacon" to guide air liners in bad visibility has been erected by the French Air Ministry at Abbeville, and has just completed its first trials. Air Union pilots flying on the "Golden Ray" London-Paris service have been using the beam with complete success.

New Air Mail Rates

THE POSTMASTER-GENERAL announces that as from February 23, the charges on air mail correspondence for all extra-European destinations have been fixed at an inclusive rate per half-oz. to include both ordinary postage and air mail fees. The charges applicable to the various countries served by air mail are shown in the following table. Except where otherwise indicated they apply to printed papers, commercial papers and samples, as well as to letters. They supersede all rates previously announced.

	First ½-oz.	Each addi- tional ½-oz.		First ½-oz.	Each addi- tional ½-oz.
	s. d.	s. d.		s. d.	s. d.
*Africa—N.			*Chile	4 0	4 0
Algeria	0 6½	0 4½	*Colombia ..	1 0	1 0
Morocco			Dutch East Indies	1 4	1 4
Tunis			Ecuador	1 9	1 9
*Africa—W.			Egypt	0 3½	0 2½
Fr. Guinea ..	0 11	0 9	Guianas	1 9	1 9
Senegal			India—		
Gambia	0 10	0 9	Karachi	0 6	0 5
S. Leone			Delhi	0 8	0 7
Africa—E.			Iraq	0 6	0 4
Kenya	0 7	0 6	Mexico	0 11	0 9
Uganda			N. Zealand ..	0 4½	0 3½
Tanganyika ..			Palestine	0 3½	0 2½
Africa—Cent.			*Paraguay ..	4 0	4 0
Belgian Congo, ..	0 8	0 6	Persia	0 7½	0 5½
via Sudan			Peru	2 3	2 3
Belgian Congo, ..	0 4	0 2	Siam	1 0	1 0
internal			S. Africa (internal)	0 3½	0 2½
Africa—S.	See		Straits Settlements	1 0	1 0
under	S. Af.		and Malay Sts. ..		
*Argentina Re-	4 0	4 0	Sudan	0 5	0 4
public			Syria	0 4½	0 2½
Australia (inter-	0 4½	0 3½	Transjordan ..	0 5½	0 4½
nal)			U.S.A.	4 0	4 0
*Bolivia	4 0	4 0	*Uruguay	1 9	1 9
*Brazil	3 6	3 6	Venezuela	1 9	1 9
Canada	0 5½	0 4½	W. Indies—		
Cent. America—			Bahamas	0 5½	0 4½
Costa Rica			Cuba	0 6½	0 4½
Guatemala			Jamaica	0 9	0 8
Honduras	1 3	1 3	Other West Indies	1 3	1 3
Nicaragua					
Panama					
Salvador					

* Printed papers and samples.

Separate rates for printed papers and samples are in force for the countries as shown below:—

	Per ½-oz.		Per ½-oz.
	s. d.		s. d.
Africa—N.	0 2	Brazil	0 10
" W.	0 4	Chile	1 0
Argentina Republic	1 0	Colombia	0 6
Bolivia	1 0	Paraguay	1 0
		Uruguay	1 0

A special notice containing full particulars of these rates is being sent to regular recipients of the Air Mail leaflet. Copies of the notice can be obtained free of charge on application at any Post Office.

AIRISMS FROM THE FOUR WINDS

C. D. Barnard Air Tours, Ltd.

On April 1, Capt. Barnard, together with Messrs. Crossley and Ayre, will be setting out on an extensive tour of England for joy-riding and general aerial propaganda. Capt. Barnard will be flying the now historic "Spider," which, it will be remembered, is the Fokker in which he, together with the Duchess of Bedford, went to the Cape and back again, besides making many other long flights. It has now been fitted for twelve passengers, and together with other alterations which have been made, it should be quite suitable for the job. Messrs. Crossley and Ayre will be flying three-seater Spartans, while there is also a possibility that an Autogiro will accompany them. Mr. John Trantum, who has recently transferred his services as a parachute demonstrator to the Irving Air Chute Co., will also make drops in connection with the tour at most places. Altogether landing grounds at over 150 towns have been arranged, and at each of these some sort of demonstration will be given, a large batch of school children will be taken up free, and payment will be made for one school boy to be trained as a pilot at the nearest flying club. Mr. D. Eskell, late of Imperial Airways and N.F.S., is in charge of the business side of the tour, which is expected to take about six months.

Miss Reynolds' Flight to the Cape

On March 1, Miss Delphine Reynolds, daughter of Sir James Reynolds, M.P., who, as mentioned last week, is carrying out a flight to the Cape via the West Coast of Africa, started on her journey from Hanworth. She is accompanied by Flight-Lieut. W. G. Pudney, an instructor of National Flying Services. The main object of the flight is to explore the possibilities of air transport along the river courses of West Africa, and they are flying a Blackburn "Bluebird" fitted with a D.H. "Gipsy III" engine. When flying from Le Bourget to Bordeaux, they had to land at St. Gaprays de Blaye, some 20 miles north of Bordeaux.

R.A.F. Cairo-Cape Flight

THE Vickers Victoria troop carriers of No. 216 Bomber Squadron, which started from Capetown on February 11 on their return flight to Cairo, reached Mpika on March 2.

The Rangoon Flight to Basra

THE three Short "Rangoon" flying-boats of No. 203 (F.B.) Squadron, which are flying to Basra from Mount Batten, arrived at Malta from Naples on February 25, after having been held up by bad weather.

Polish Winter Challenge

THE result of the Polish Winter Challenge, over the course Lublin, Zamosc, Luck, Brzest, Bugien, Biala, Podlaska, Lublin, is announced as follows:—1st, K. Chorzewski,

on an R.W.D.4, fitted with a Cirrus Hermes II, average speed, 157·963 k.p.h. 2nd, Lieut. Promaszko, on a similar machine, also fitted with a Hermes II, average speed, 156·013 k.p.h.

A Paris-Tokio Flight

THE French pilots Burtin and Moench left Le Bourget on March 2 for Athens on the first stage of a flight to Tokio.

Mrs. Bruce's "Bluebird"

THE Blackburn "Bluebird," on which the Hon. Mrs. Victor Bruce recently completed a world tour, was exhibited this week in the booking hall of Charing Cross Underground Station.

No. 209 Flying-Boat Squadron

THE two surviving "Iris" flying-boats of No. 209 (F.B.) Squadron are leaving Mount Batten for Gibraltar, as soon as the weather permits, to co-operate with the Mediterranean fleet in manoeuvres.

The Schneider Contest

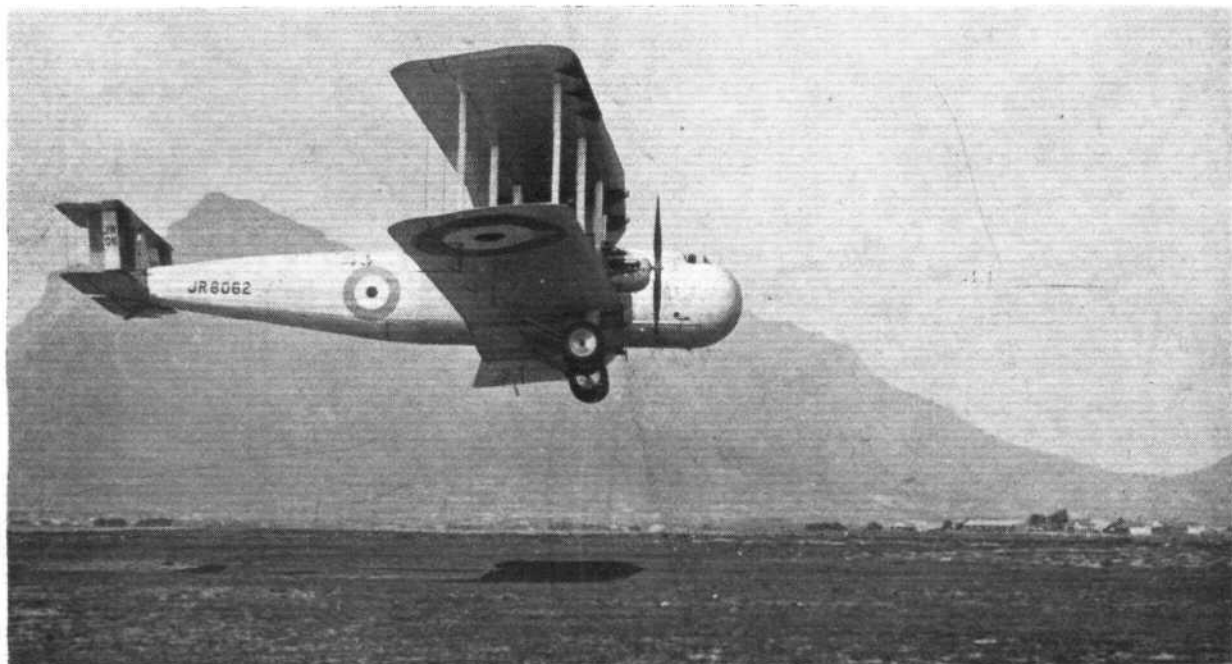
IT is stated that the French team which has gone into training for the Schneider contest consists of Commander Amaurich, of the Navy, Capt. Marly, Capt. Vernold, Lieut. Retourna, Sergt. Major Dumas, Sergt. Baillet, Sergt. Goussin, and Sergt. Labreux. The first stages of training will be carried out on Bernard monoplanes with Hispano-Suiza engines, and there are also, it is stated, two Nieuport-Delage seaplanes at Berre. The racing seaplanes are not yet ready. They will include Bernards, Nieuport-Delages, and Dewoitines. The Air Ministry is ordering two new Supermarine-Rolls Royce S.6 seaplanes, instead of one, for the use of the British High Speed Flight.

Recent Records

FLYING a new Bleriot monoplane, with 600-h.p. Hispano-Suiza engine, the two French pilots, Boussoutrot and Rossi, claim to have established a new record for duration and distance in a closed circuit on March 2, when they landed at Oran after having been in the air for 75 hrs. 22 min. They were flying *via* the circuit Oran-Senia, and covered about 8,805 km. (5,500 miles), thus beating the previous record of 8 hr. 9 min. and 616 km. established by the Italians, Maddalena and Cecconi.

Three other French pilots, Le Brix, Duret and Cadru, attempted to beat the same record, but were forced to land, on February 28, after 52 hrs. flying.

The world's altitude record for light seaplanes has, it is reported, been beaten by the Italian pilots Antonini and Trevisan, who reached a height of 5,324 m. (17,467 ft.) on a Caproni 100 fitted with a Cirrus Hermes II.



THE SERVICE FLIGHT TO THE CAPE: One of the Vickers "Victoria" Troop Carriers of No. 216 (Bomber) Squadron landing at Maitland Aerodrome, Cape Town, on February 7. Table Mountain will be seen in the background.

Avro "Trainer" Handbook

A VERY detailed illustrated description of the Avro "Trainer," Type 621, was published in FLIGHT, of May 2, 1930. Our readers will therefore be familiar with the general design and construction of this machine. A. V. Roe & Co., Ltd., have now issued a very excellent instruction book for the "Trainer," with notes on rigging, maintenance and repair. The book may be obtained from the offices of FLIGHT, the price being 3s. 6d. net. In compiling the instruction book on the "Trainer," it has been assumed that the machine has been received in a packing case as despatched from the factory, and the complete sequence of operations from unpacking to test flight is dealt with. Later chapters deal with maintenance and inspection, while the last part of the book, rather more than half of the total number of pages, explains in very clear language, assisted by excellent illustrations and diagrams, how repairs of various sorts can be made to the welded steel tube fuselage and all-metal wings. The book is written on the assumption that the reader does not necessarily know a great deal about aircraft, and is thus of very considerable value not merely to users of the particular machine, but of metal aircraft generally, and its appeal should therefore be much wider than might be assumed from the title of the book. Apart from dealing with the aircraft structure, the book contains information on such subjects as preparing the engine for the first run, calibration of the airspeed indicator, and swinging the compass. The float seaplane version of the "Trainer" is also dealt with, and information is given of how to effect repairs of both wood and metal floats. Altogether the book is an unusually interesting one, from which almost anyone connected with aircraft can learn something.

An Attractive Booklet

AUTO AUCTIONS, LTD., of Burlington Gardens, London W.1, are sending round a very attractive booklet dealing with every phase of their business. This describes their Aviation Department, and the all-metal Bluebird for which they are agents, as well as all their other departments dealing with motor cars, new and second-hand, insurance, foreign travel, etc.

Royal Air Force Club

THE annual general meeting of the Royal Air Force Club will take place at 5.30 p.m. on Wednesday, March 18, 1931.

Sir Malcolm Campbell

HIS MAJESTY THE KING, on February 21, conferred the honour of knighthood upon Capt. Malcolm Campbell, who recently broke the world's land speed record on his Napier engined car "Bluebird II," at Daytona. Sir Malcolm, it will be remembered, served in the R.F.C. during the war.

Italian Atlantic Squadron Home

WHEN Gen. Balbo and his companions of the recent formation flight from Italy to South America arrived at Gibraltar, on February 17, en route for Rome, they were accorded a warm reception, and on arriving at Genoa on February 19, a greater welcome still awaited them. Their reception in

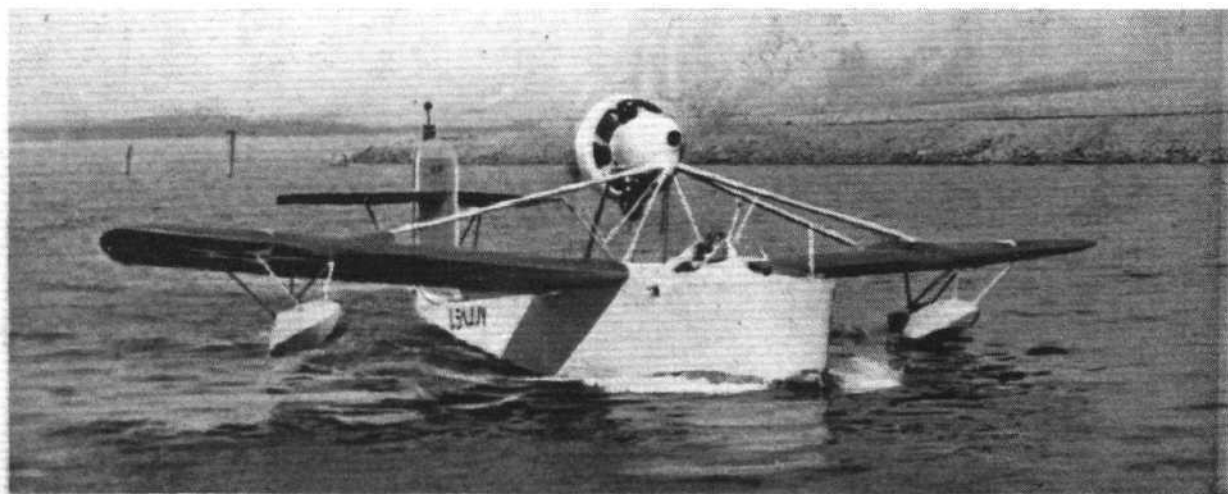
Rome, on February 20, however, was triumphal. The railway station, the public offices, the houses lining the road followed by the airmen, and the Piazza Colonna were a blaze of illuminations, flags, carpets, and posters displayed with a profuseness seldom seen even for a Royal procession. Signor Mussolini and other members of the Government received them at the station, and on the following day they were received by King Victor Emanuel, General Balbo later being accorded the freedom of the City of Rome.

Bibby's 21st Annual

ONE day in early March, 1910, a little man stepped off the train at Eastchurch, Isle of Sheppey, and with his bag in his hand proceeded towards the aircraft works of Short Brothers. He had come down from Newcastle in order to try his hand at aircraft work, and as he trudged along the muddy road his beaming expression gradually changed into one of puzzled doubt, and finally to sheer disgust. Before reaching the works he had made up his mind to try to "stick it" for a week, although he was not optimistic. Everything, from the works to the landscape, was primitive, and not at all what he had expected. But the horrible fascination of aviation managed to grip him during that following week, and sometime during the present week he completes 21 years of uninterrupted association with Short Brothers. Exactly when the beaming expression returned to Mr. Bibby's face we do not know. It was probably during his first morning's work at Shorts. And to the best of our knowledge, the expression has been there ever since. No one has ever seen Mr. A. E. Bibby looking really grumpy, and as Production Manager of Short Brothers' aircraft works, his infallible good humour must have been a great asset when unforeseen delays occurred. Not that these have been frequent. In fact, there are probably few firms who are so habitually up to time as Shorts. And that must be very largely due to Mr. Bibby's infectious cheerfulness, coupled, of course, with very real organising ability. Congratulations Bibby! May the next 21 years see you as cheerful as ever.

New Luxor Goggles

MESSRS. E. B. MEYROWITZ, creators of the universally-known Luxor goggles, have just placed on the market a new model to be known as "Number Ten," the special features being extra long, flat safety-glass lenses, and a new type of ventilation which was experimented with and approved by the late Sir Henry Segrave. He wore the first of these goggles during his successful attempt on the world's land speed record, and approved of same as the "perfect goggle." Another feature of this new model is the large, flat cushions which form perfectly to the contour of the face, ensuring perfect comfort to the wearer. The lenses and cushions are detachable, and can, if necessary, be replaced in less than one minute. The price of this new model, including leather case, is 45s., and same can be seen at either of the London branches of E. B. Meyrowitz, Ltd., or any of their agents.



A FLYING BOAT FOR SUBMARINES: The U.S. Navy Department has recently accepted a small flying boat specially designed to be carried in submarines. This machine, shown above, built by Grover Loening, of New York, is a single-seater monoplane fitted with a 100-h.p. engine driving a pusher airscrew. The engine is mounted on hinged struts so as to fold back on to the hull, while the wings also fold back. The whole machine can thus be stowed in a comparatively small "tube" in the parent submarine.

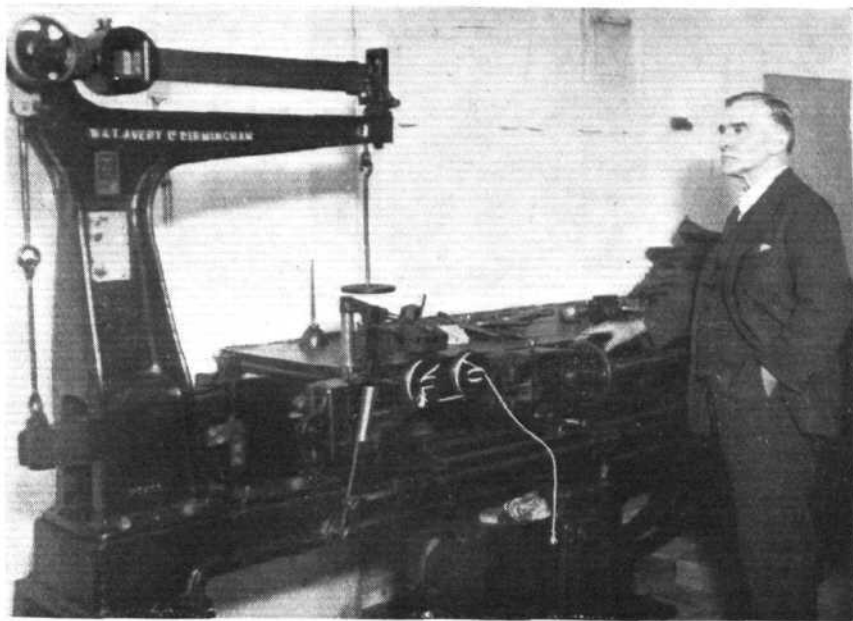
THE IRVIN AIR CHUTE

OF recent years air chutes have become so much an ordinary feature of the equipment of pilots, particularly since they are standard and compulsory by the R.A.F., that people are apt to take them for granted while knowing little or nothing about them.

One of the best known of these is the Irvin Air Chute, which is the standard equipment in the Royal Air Force and American Air Services, and is also used in very large numbers by air mail pilots, test pilots and many others, and in most of our colonies—Belgium, Poland, Russia, Sweden, Yugoslavia, Denmark, Esthonia, etc. This particular chute has been developed in order to fill the need for a reliable and practical life-saver, which the pilot or passenger may use in the case of disabled aircraft, structural breakages in the air, or as has happened several times during the working of that magnificent service, the American Air Mail, when the pilot finds himself in thick fog with his fuel running out and has, therefore, to abandon the machine and save himself. It is of the "free type," "manually-operated," and is carried in a pack unit attached to the person who is wearing it, and it does not connect with the aircraft in any way whatsoever. This means that in an emergency the wearer has only to jump out of the aircraft and then pull the ring attached to the "rip cord" in order to come down safely.

The Irvin Air Chute is no new and untried article, but has been used with safety for over 17 years under all sorts of climatic conditions. The fact that it has been adopted by the British Air Ministry and the United States Government, vouches for its safety qualities. Both these authorities have carried out an extended series of tests and demand that the chute will withstand the opening shock imposed by the fastest speed obtainable on service aircraft in flight. The U.S. government has, for example, given it over 50,000 "dummy" test drops. During the past years over 30,000 live drops have been made without failure, while Capt. Stevens, of the U.S. Air Corps, holds the highest altitude descent on record by jumping from 24,406 ft. At the moment of writing, over 350 aviators have saved their lives in emergencies by its use when they would otherwise have been killed.

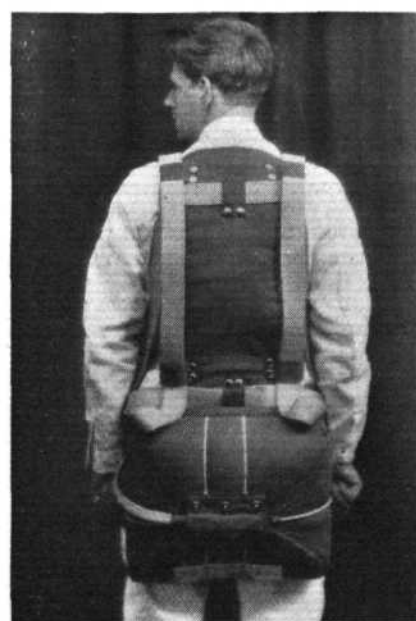
One of its peculiar attributes is that



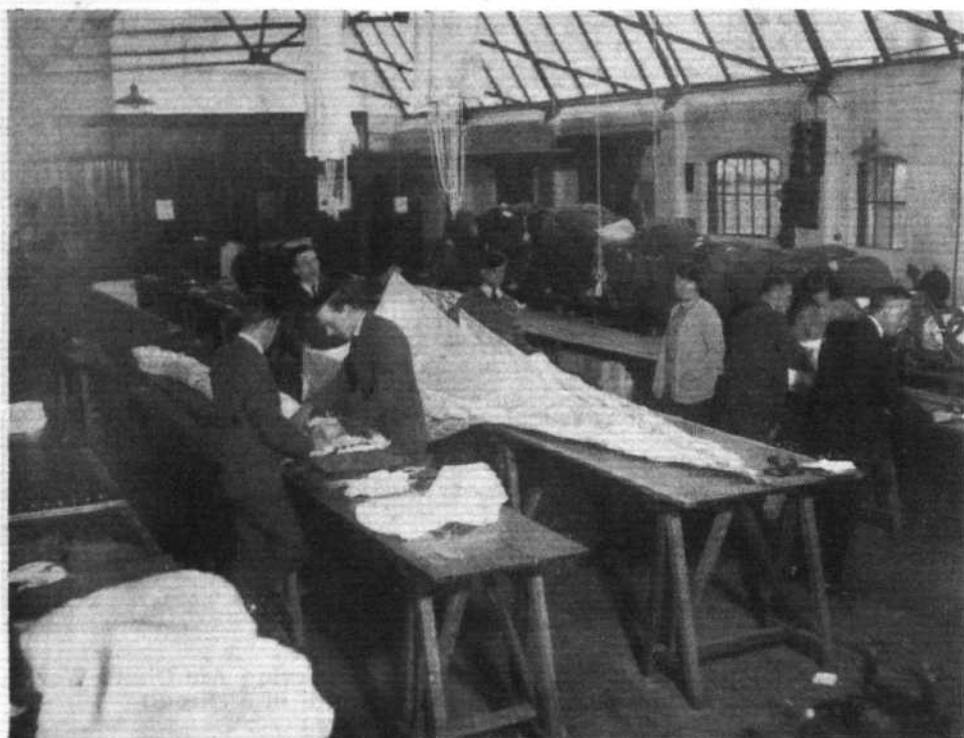
Mr. W. Adamson (Chief Inspector) at the Irving Air Chute Works, Letchworth, testing the strength of a shroud line. (FLIGHT Photo.)

in $1\frac{1}{2}$ seconds after the rip cord has been pulled the air chute is completely open and assumes its normal rate of descent. This accounts for the fact that several pilots have saved their lives at extremely low altitudes, as on the occasion of one, Walter Lees who jumped from a height of 150 ft. without losing his life. It was not, however, until the latter part of the war, 1916-18, that the air chute was brought into general use, and it was at this time that the U.S. Air Service Board of Aeronautical Engineers instituted a series of exhaustive tests on a large number of air chutes. All types were tested to destruction, and it was determined what were the general points to be considered in parachute equipment. These were:—

- (1) It must be possible for the aviator to leave the aircraft regardless of the position it might be in when disabled.
- (2) The operating means must not depend on the aviator falling from the aircraft.
- (3) The parachute equipment must be fastened to the body of the aviator at all times while in the aircraft.
- (4) The operating must not be complicated or liable to foul and must not be susceptible to damage through any ordinary service conditions.



The new Irvin "Quick release" is seen on the left, while in the centre is the "Form Fitting" pack in use in a cabin aircraft. On the right is the standard "Seat-Pack" type of air chute.



A general view of the assembly and packing room at the Leitchworth Factory. (FLIGHT Photo.)

"Seat Pack" "Lap Pack" and "Back Pack." The "Seat Pack" is used as a seat cushion and thus removes all weight and bulk from the person of the wearer, and is the type most generally used by pilots. The "Lap Pack" is more favourable for observers, gunners and photographers, where the wearer has more room directly in front of him and below the waist line while standing up in the cockpit. The "Back Pack" has been designed more particularly for use in balloons and airships or for large heavier-than-air craft, as it is carried on the back and permits complete freedom of movement when walking, or for example, climbing about the rigging of an airship. The weight of the 24 ft. chute, complete with harness and any of the types of containers, is approximately 18 lb. All types are secured by the same type of woven linen webbing harness which has a tensile strength of 3,000 lb., and

(5) The parachute must be of such size and so disposed as to give the maximum comfort to the wearer and permit him to leave the aircraft with the least difficulty or delay.

(6) The parachute must open promptly and must be capable of withstanding the shock incurred by a 200-lb. load falling at a speed of 400 m.p.h.

(7) The parachute must be steerable to a reasonable degree.

(8) The harness must be comfortable and very strong and designed so as to transfer the shock of opening in such a manner as to prevent physical injury to the aviator. It must also be sufficiently adjustable to fit the largest and smallest person.

(9) The harness must be designed as to prevent the aviator from falling out when the parachute opens regardless of his position in the air, and at the same time it must be possible quickly to remove the harness when landing in the water or in a high wind.

(10) The strength "follow through" must be uniform from the harness to the top of the parachute, bearing in mind the old axiom "No chain is stronger than its weakest link."

(11) The parachute must be designed so as to be repacked easily with little time and labour.

is fully adjustable. The metal snap-hooks, and adaptor buckles which are used, are all of chrome-nickel steel with a tensile strength of well over 5,000 lb., and are either galvanised or cadmium plated. The chute itself is made of special woven high-grade silk, while the suspension, or shroud lines are silk cords of 400 lb. tensile strength and are continuous from the point of attachment on one side of the harness to the other, passing through and over the top of the air chute, their entire length being free from knots and splices.

At the apex of the main chute is a small miniature chute, known as the "pilot chute," approximately 30 in. in diameter, and is constructed with steel ribs and a spring in such a manner that it folds up under tension and is thus packed in the container. Immediately the container is opened this "pilot chute" springs out, catches the air, and pulls the main chute out after it. The safety of the chute does not, however, rely entirely upon the action of this "pilot chute" which is merely an added safety feature and slightly increases the speed of opening, allowing jumps to be made safely at very low altitudes. It is packed in its container in a simple manner without the use of any special equipment, and the rip cord which secures it in this container is of flexible aircraft steel cable with locking pins on one end and a chrome nickel steel ring on the other. All that is necessary to open the chute is a jerk on this ring thus removing the locking pins from the

The Irvin Air Chute passed all these tests and was adopted by the U.S. Air Service early in 1919. The strength imposed by these tests is such that the wearer is perfectly safe in delaying opening the air chute until he is well clear of the aircraft, and deliberate "delayed" drops of more than 1,000 ft. have often been made without the wearer receiving any injury from the opening shock. To meet various requirements, it is made in three sizes, the General Service Type being 24 ft. in diameter, that for exhibition or training being 28 ft. in diameter, and there is also a smaller one of 22 ft. which may be used in conjunction with the 28 ft. chute for exhibition or training jumps. The 24 ft. chute is the standard equipment of many Air Forces, and is packed in three types of containers, namely the



A few of the sewing machines in the machine room.

(FLIGHT Photo.)

container and allowing the chute to free itself.

For commercial use there is a further type called the "Form Fitting Back Pack" which has been perfected for use in aircraft with small cockpits where the construction does not permit comfortable or convenient use of the seat or ordinary back pack type. The pack frame is constructed from special resilient spring steel wire formed so that it fits the contour of the wearer's back, and the chute itself is thereby folded over a greater area, reducing the bulk and thickness to a minimum. A further adaptation of this is its use in cabin aircraft where it is incorporated in the back of the passenger's chair, fitting in with the upholstery scheme of the cabin. In this form it remains at all times in the chair and the harness is arranged so that the passenger merely seats himself and thrusts his arms into the harness. This "Form Fitting Back Pack" is available with both the standard air chute and the "Caterpillar" air chute.

The Caterpillar air chute is an all-silk chute which descends at a slower rate than the ordinary type, and has been produced as more suitable for private owners. It is identical in all respects as regards speed, with the standard type, but is somewhat cheaper, costing only £60. Its name is taken from the Caterpillar Club, which is the name given to the body of men whose members have saved their lives by means of the Irvin Air Chute. Membership of the Caterpillar Club is open to all irrespective of sex, nationality or status, and all those who have saved their lives in such a manner are presented with a caterpillar tiepin in honour of the fact. The name "caterpillar" is taken as the symbolic representative of the action of the silk air chute, as the caterpillar lets itself down to earth on silken cords.

There is still another form of this versatile air chute, and this is the "Quick-Connector Pack," which has been developed and perfected by the British Company of the Irvin Air Chute in order to provide a safe and reliable life-saving device for passengers and pilots where the construction of the aircraft does not permit wearing the chute during flight. The maximum efficiency of any chute is, of course, obtained when it is worn upon the person at all times, since he is then in a position to use it immediately, but where this is impossible the "Quick-Connector" should provide a good substitute. With this the aviator only wears the comfortable harness during flight and the air chute is carried separately in a readily accessible position. In emergency, it is only necessary to place the pack against the chest where it is instantly and easily attached to the harness by means of a simple connecting device. This provides for the attachment of the pack at two points, but the chute will, however, function safely when attached at only one. Likewise, it is possible to turn it end for end without altering the attaching arrangements or decreasing the safety. After attachment, it is operated in exactly the same manner as all the other types, with a rip cord.

A recent achievement by the Irving Company, is the pro-



A batch of Irvin air chutes packed ready for delivery.
(FLIGHT Photo.)

vision of a single point quick release for the harness, which has made possible the safe use of air chutes by pilots in the Fleet Air Arm. Up to date, there has always been danger of the wearer being dragged along under water as soon as he landed and therefore drowned because he could not divest himself of the harness in time. With this quick release it is only necessary to press a small button and turn the releasing knob which is situated in the front of the harness to allow all four attachment points to fall away from the wearer. As a result of this the personnel of the Fleet Air Arm is now completely equipped with Irvin air chutes. A further advantage of this quick release is that it will allow the standard seat pack type of chute being left complete with the harness in the cockpit when the wearer gets out, and to be re-attached easily round him when he gets in again.

The works at Letchworth are a model of cleanliness and careful inspection as befits an article upon which the lives of so many men depend. The air chute is subjected to a rigorous series of tests and inspections from the time the material goes into the factory until the finished chute is packed for delivery. Female labour is largely used, since the canopy itself is built up by a large number of segments, the seams of which have to be sewn in a particular manner in order to pass the A.I.D. inspection. In the machine room one sees a large number of electrically-driven sewing machines all going hard and these are used for a variety of purposes including not only sewing the seams of the canopy but also, by means of an ingenious device attached to the machine, they are able to sew on such things as the hooks and eyes on the container, the ends of the shroud lines and many other points.

IN PARLIAMENT

Cost of Squadrons

MR. MONTAGUE, on February 18, in reply to the Marquess of Clydesdale, said: Figures of total expenditure for each type of squadron cannot be given with precision, but as a rough estimate the annual cost of a regular single-engine day-bomber squadron may be stated as about £100,000, and that of an auxiliary Air Force squadron as about £50,000.

India and Air Mail Services

MR. BENN, on February 23, in reply to Lt.-Com. Kenworthy and others, said the intention is that Imperial Airways should carry the air mails from the United Kingdom to Karachi and that the Government of India should run their own service across India. As regards the extension to Australia, the service is at present in operation between the United Kingdom and Delhi only, from Karachi by the Government of India. The delay in extending it across India has been due partly to technical difficulties in establishing the ground organisation across Burma, partly to financial stringency and partly to changes of plans. The extension to Calcutta is expected to be in operation by the end of this year.

Sir Samuel Hoare: Is it not an unfortunate thing that, in spite of difficulties, the French and Dutch lines should be flying across India before the British lines.

Mr. Benn: The French and Dutch flights have not taken place under the conditions envisaged as applying to any British concern. In point of fact, the flying done has been done under the control of the Government of India.

Plymouth Flying Accident

CAPT. HAROLD BALFOUR, on February 25, asked the Under-Secretary of State for Air whether the recognised procedure whereby the instructor engaged on instructional flying in the Royal Air Force aircraft is in command of the machine, regardless of the executive rank of the pupil being possibly

senior to that of the instructor, is made known to all ranks; and whether, in view of the recent flying-boat accident, he will consider republishing this in the form of an Air Ministry Order?

Sir Nicholas Grattan-Doyle asked whether, in view of the evidence given at the inquiry into the recent disaster to a flying-boat at Plymouth, a revision will be considered of the discipline of the Royal Air Force so as to provide for the absolute control of all such craft during flying exercises being in the hands of pilots experienced in heavy seaplane work, notwithstanding the presence aboard of inexperienced persons of higher rank?

Mr. Montague: The answer to the first part of the question is in the affirmative. With regard to the second part, and to the question put by Sir N. Grattan-Doyle, it is being considered whether any expansion or clarification of the Regulations is desirable. Since the Members clearly have in mind the recent most regrettable accident to a large flying-boat at Cattewater, I think it my duty to inform the House that it has emerged quite clearly from the court of inquiry that this accident would not have occurred but for direct disobedience of orders on the part of an individual officer. I may add, since there has been considerable misconception on this point, that it has also been established that the officer concerned went up simply to act as marker for gunnery practice, not for flying instruction.

Fairey-Napier Monoplane

MR. MONTAGUE, in reply to Mr. Horrabin, said the new long-range Fairey-Napier monoplane which is now being built, is being built not for any specific attempt for a record non-stop flight, but in pursuance of the general policy of increasing the range of aircraft by all practical means, and thereby further developing the powers of mutual reinforcement by air forces in different areas which is an essential feature of air strategy.

RUSTLESS STEELS AS APPLIED TO AUTOMOBILES AND AIRCRAFT*

By DR. W. H. HATFIELD

IN the paper on "Steels for Automobiles and Aeroplanes," which the author presented to the Institution in 1929, the present phase of the subject was necessarily dealt with in a somewhat brief manner only. The invitation, therefore, to expand this branch of the subject, upon which he has spent so much time and research, was gladly accepted.

Twenty years ago, rustless steels were not in existence; to-day, as a result of researches at home and abroad, coupled with painstaking technological development in the steel works, truly resistant steels are available possessing a wide range of mechanical and physical properties. In dealing with the subject, the author has the advantage, too, of being able to discuss the actual service rendered by such steels over a now sufficiently long period of time.

The application of these steels naturally subdivides itself into two classes of parts, *i.e.*, one class, which naturally first makes its appeal, where the surface is put into service in the polished condition and retains its brightness with the passing of time; the other class, generally more severely stressed items, where structural strength can be maintained at the same time as resistance to corrosive conditions.

Turning to aircraft, we have gained experience as regards the fuselage, wing spars, all kinds of fittings and plates, hull plating, rubbing strips, floats, exhaust manifolds and pipes, various non-magnetic parts, such as instrument supports, etc., and bolts, nuts and rivets.

The usefulness and advantage of rustless steel in such various applications are established, and it is obvious that, apart from the over-ruling characteristic of resistance to corroding media, demand must have been made and satisfied as regards a wide range of mechanical properties. Not only so, but the steels have necessarily had to be produced in varied form, *i.e.*, bar, sheet, strip, sections, wire, forgings, castings, tube, etc., and the present position has only been rendered possible as a result of excellent pioneering work in

which several steel-making firms and many enthusiastic individuals have been concerned.

Table I shows the empirical compositions of the essential rustless steels which have been successfully applied in these fields, and against each steel will be found numbers of specifications which are met by that particular composition.

TABLE I.—RUSTLESS STEELS AS APPLIED TO AUTOMOBILES AND AIRCRAFT. Name, Specifications, etc. Carbon. Manganese. Silicon. Chromium. Nickel.

A. Stainless iron, D.T.D. 53, 39, 23B, 21, 97, 102, 105, 46A and S.61	<0.15	<0.50	<0.50	>12.0	Accidental
B. Stainless steel, D.T.D. 22A, S.62	<0.35	<0.50	<0.80	>12.0	Accidental
C. S.80, D.T.D. 60A, 146, 76	<0.25	<1.0	<0.60	16.0/20.0	About 2.0 per cent.
D. Austenitic 18/8, D.T.D. 42S, 43S, 43H, 144, 57A	<0.15	<0.50	<0.80	18.0	8.0
E. Austenitic 13/13, D.T.D. 24A	<0.15	<0.50	<0.80	13.0	13.0

Table II shows the typical mechanical properties representative of the different conditions in which the steels can be available.

It will be seen that these five steels, or really types of steels, fall into two categories. Steels A, B and C are alloys which are put into their service condition essentially by hardening and tempering, *i.e.*, they can be regarded as within the martensitic class, although steel C, with its high chromium and nickel content, is on the border line. Steels D and E are used either in the very soft condition, as induced by heating to very high temperatures, followed by quick cooling, or in the condition in which cold-working effects are superposed upon that soft condition.

Diagrammatic heating and cooling curves are given in Fig. 1. The heating and cooling curves for steels A and B are similar in form to the typical carbon steel curves. The presence of a large amount of chromium has the effect, however, of raising the change points, so that whereas in a carbon steel of eutectoid composition the carbide solution on heating occurs at about 730° C., in the case of steel A the

* Abstract of paper read before the Institution of Automobile Engineers on February 3, 1931.

TABLE II.

Specification.	Form.	Typical Analyses.					Typical Conditions.	Typical Mechanical Properties.					Reverse Bend.	Spec. Gravity.	Modulus of Elasticity.
		C.	Mn.	Si.	Ni.	Cr.		0.1 per cent. Proof.	Max. Stress.	Elong. per cent.	R/A. per cent.	Izod.			
A. { D.T.D. 53 .. " 39 .. " 97 .. " 23B .. " 102 .. " 21 .. " = S.61	Bar	0.08	0.12	0.10	0.15	13.5	{ A.C. 950° C. .. A.C. 750° C. .. Annealed 800° C.	24.0	33.9	32.0	72.0	80	—	7.725	13,100
	Sheet	0.07	0.06	0.07	0.31	13.65	Cold-drawn and tempered	20.0	32.1	27.0	—	—	4 (r=3t)	—	—
	Tubes	0.10	0.32	0.21	0.18	13.60	{ A.C. 1,000° C. .. T. 780° C. .. Cold-drawn and tempered	20.0	31.0	30.0	—	—	4 (r=3t)	—	—
	Sheet	0.14	0.31	0.33	0.31	13.3	{ O.H. 950° C. .. T. 740° C., W.Q.	22.0	38.7	22.0	—	—	—	—	—
	Tubes	0.10	0.32	0.21	0.18	13.60	{ H. 950° C. and T. 550° C. .. A.H. 1,000° C. and T. 150° C.	30.0	38.0	21.0	—	—	—	—	—
	Bar	0.10	0.32	0.21	0.18	13.60	{ O.H. 950° C. .. T. 740° C., W.Q.	24.0	40.8	29.0	71.0	90	—	—	—
B. { D.T.D. 105 .. " 46A	Tubes	0.11	0.33	0.11	0.21	13.71	{ A.C. 1,150° C. .. A.C. 1,150° C. .. Cold-rolled and treated	37.0	55.2	19.0	—	—	—	—	—
	Strip	0.18	0.29	0.31	0.32	13.82	{ A.C. 1,150° C. .. A.C. 1,150° C. .. Cold-rolled and treated	66.0	101.0	8.0	—	—	Close bend r=3t or 5t*	—	—
C. { D.T.D. 60A .. " 146 .. " 76 .. " = S.80	Bar and forgings	0.27	0.26	0.35	0.29	13.1	{ O.H. 950° C. and T. 700° C., W.Q.	34.0	50.0	25.0	61.5	50	—	7.738	13,000
	Sheet and strip	0.11	0.15	0.13	1.9	17.9	{ A.H. 950° C., T. 500° C., A.C. Softened, 670° C.	40.0	55.0	7.0	—	—	8 (r=3t)	7.731	12,000
D. { D.T.D. 42S .. " 43S .. " 43H .. " 144 .. " 57A	Sheet and strip	0.11	0.15	0.13	1.9	17.9	{ O.H. 960° C., T. 520° C., W.Q.	31.0	42.0	19.0	—	—	—	—	—
	Bar	0.12	0.31	0.29	2.75	17.73	{ O.H. 960° C., T. 520° C., W.Q.	39.0	56.8	19.0	55.8	45	—	—	—
	Sheets	0.15	0.23	0.41	9.22	17.53	{ A.C. 1,150° C. .. A.C. 1,150° C. .. Cold-rolled and treated	12.1	41.5	46.0	—	—	6 (r=3t)	7.905	12,750
	Bars	0.14	0.23	0.51	8.91	17.75	{ A.C. 1,150° C. .. A.C. 1,150° C. .. Cold-rolled and treated	13.2	42.7	64.0	68.0	102	—	—	—
	Bars	0.13	0.28	0.70	8.7	17.7	{ Cold-rolled and treated	32.0	54.0	35.0	66.0	105	6 (r=3t)	—	12,500
	Sheet and strip	0.13	0.28	0.70	8.7	17.7	{ Softened and cold-rolled	12.1	41.5	46.0	—	—	4 (r=3t) or (r=5t)*	—	—
E. { D.T.D. 24A	Sheet and strip	0.10	0.25	0.20	12.7	12.9	Softened	42.7	65.3	18.0	—	—	—	—	—
	Wire for split pins	0.10	0.31	0.34	12.49	12.63	{ A.C. 1,000° C. ..	15.1	35.5	50.5	—	—	6 (r=3t)	7.940	12,750
	Sheet and strip	0.10	0.25	0.20	12.7	12.9	Softened	15.2	38.6	58.0	70.0	95.0	—	—	—
	Wire for split pins	0.10	0.31	0.34	12.49	12.63	{ A.C. 1,000° C. ..	15.2	38.6	58.0	70.0	95.0	—	—	—

* According to thickness. A.C. = Air cooled. T. = Tempered. O.H. = Oil Hardened. W.Q. = Water Quenched. H. = Hardened.

corresponding change occurs at about 840° to 850° C., and in steel B at about 830° C. The change is not so well defined in the chromium steels as in plain carbon steels, and the complete solution of the carbides necessitates that the material be heated to a temperature some 100° C. higher than this. The change on fairly slow cooling is depressed by the presence of chromium to about 300° C. Steels D and E are austenitic steels, and the heating curves for these steels are, therefore, characterised by the absence of the recalescence phenomenon.

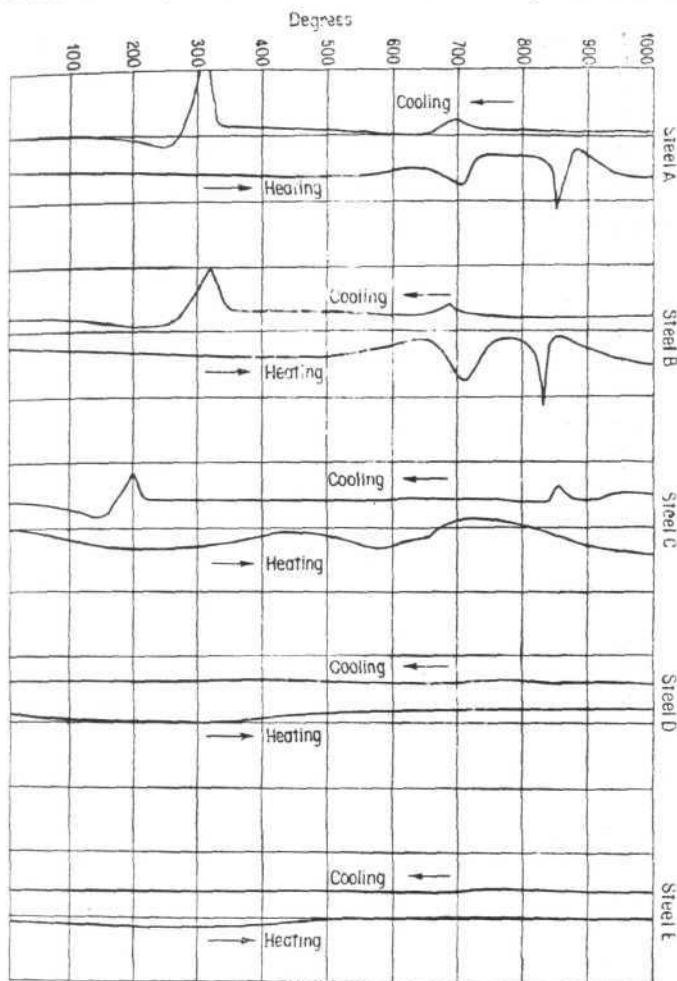


Fig. 1.

The heating and cooling curve for steel C, which has a composition bordering between the austenitic class and the hardening class, is rather more difficult to interpret. It would appear, however, that, on heating, some constituents pass into solution over a range of temperature from about 520° to 680° C. On fairly slow cooling, the carbide precipitation occurs at about 200° C.

Steels A, B and C are used where advantage can be taken of the high strength, obtained by hardening and tempering, along with good resistance to corrosion. Steels D and E are used where the highest resistance to corrosion is required and mechanical strength is secondary, although a technique is now being rapidly developed where the high resistance to corrosion can be accompanied, in certain forms, by high strength induced by cold-working effects.

As regards steel D, *i.e.*, the austenitic 18 per cent. chromium 8 per cent. nickel steel, it should be recorded that the modification of the characteristics, as regards corrosion effects, by the addition of other elements, has led to large metallurgical developments which the author considered outside the scope of the present paper.

Rolls-Royce Engines Renamed

We have been asked to state that in future the Rolls-Royce "F" and "H" types of aero engines will be known by names, the "F" engines series being known as the "Kestrel," and the "H" engine as the "Buzzard." To differentiate between the gear ratios and compression ratios, it has been decided that the best course will be to designate the present F.XI, F. XII and F. XIV, respectively, as "Kestrel I," "Kestrel II," and "Kestrel III." The compression ratios will continue to be indicated by the letters A and B, and the superchargers by MS and S. By the new system,

AIRCRAFT

When wood construction changed to all-metal construction, the first material to be used was, naturally, Duralumin. Latterly, the change has been from Duralumin to steel, and steel with a proof stress of 65 tons has become a much used material for planes in this country; even higher values as regards proof stress are demanded, and it is, therefore, of interest to consider the position of the rustless steels.

The reason for the demand for rustless steels is the necessity for resisting corrosion, and particularly as regards corrosion fatigue. It is well known that, under conditions where corroding influences are at work, ordinary steels fracture under apparently abnormally low stresses.

Steels A and B, *i.e.*, the martensitic chromium steels, have several disabilities. In the first place, they are not adequately resistant to the corroding influence of a marine environment. Also, they are rather unsatisfactory from a welding standpoint, and fittings produced by welding must be subsequently heat-treated.

Steel C is a much more satisfactory material as regards resistance to corrosion, but disabilities exist as regards the facility and satisfactoriness of the welding operation. This steel is successfully used for plate fittings, nuts and bolts, etc.

Steels of the D class are the most interesting ones for aircraft. As regards corrosion, the results are good, and, also, steels now being produced may be very satisfactorily welded. In the fully softened condition, however, the proof stress is very low, as shown in Table II. Fortunately, it has been found that the strength can be greatly increased by cold-drawing and cold-rolling operations. It will be appreciated, however, that the actual cold-working operation uses up a progressive proportion of the intrinsic ductility of the material, and hence the residual ductility in the sheet or strip must be sufficient to permit of further plastic deformation in the cold-forming of the particular part. Excessive cold-working effects, when resulting in high residual internal stress, may lead to the well-known phenomenon of stress-cracking with time.

However, the inducing of high strength by cold-rolling and cold-drawing is very advantageous, and leads to the availability of a satisfactory rustless material of high proof limit. The author feels that, for the time being, until the technology is more completely developed and understood, proof limits should not be insisted upon in the sheet or strip much in excess of 50 tons per sq. in. With such a value, and with such a high residual ductility as is obtained, such material is invaluable. It might, for instance, be stated in passing that the considerable ductility has an advantageous effect upon the real factor of safety. Much higher values are practicable, but this field should be gradually explored by a thorough testing out under service conditions, where very high stresses are sought to be dealt with. When the material has been heavily cold-worked it can be subjected to a heat-treatment of 300° C. with advantage.

As regards the use of the austenitic steel D in the soft condition, it may be said that it has been successfully employed for plate fittings of low stress values, hull fittings, rubbing strips, and for certain bolts and nuts. The work-hardened condition (57A, etc.) has been used, or is being tested out as regards suitability, for fuselage, wing spars and ribs, joint plates, hull plating, floats, etc., and is being explored as regards producing material suitable and thin enough for wing covering. The non-magnetic properties of the soft condition have led to its use for instrument supports, etc.

Rivets in steel A proved insufficiently resistant, and steels D and E have latterly been successfully developed for that purpose.

In conclusion, the author would acknowledge his indebtedness to Messrs. Thos. Firth and Sons, Ltd., for their permission to present the data contained in the paper, and to his assistants, Mr. G. Stanfield, Mr. C. C. Hall, Mr. R. Staton, and other members of the Brown-Firth Research Laboratories' staff for their assistance in this particular field.

the F.XI B thus becomes "Kestrel I B," and so forth. The "H" engine, which has only two ratios corresponding to F. XII and F. XIV, will be designated "Buzzard II" and "Buzzard III."

Col. Darby's New Address

As our readers will probably be aware, A.D.C. Aircraft, Ltd., have now closed their London offices at Regent House, Kingsway, and are conducting their business from the Aircraft factory, Waddon, Surrey. Col. M. Ormonde Darby's personal office is now at Kingsway House, 103, Kingsway, London, W.C.2. Telephone, Holborn 6156.

THE ROYAL AIR FORCE

London Gazette, February 24, 1931.

General Duties Branch

H. A. J. de S. Barrow is granted a short-service commn. as a Flying Officer with effect from Feb. 2 and with seny. of Feb. 2, 1927. The following Pilot Officers on probation are confirmed in rank (Feb. 21):—F. G. L. Bain, G. S. Barrett, L. T. G. Barber, W. J. Brighty, H. T. Clark, R. C. H. Crosthwaite, H. I. Dabinett, G. A. C. Foster, D. McC. Gordon, J. A. Hankins, N. C. Hendrikz, M. H. Kelly, R. L. Kippenberger, C. A. M. Kyrke-Smith, the Hon. F. D. H. Lea Smith, R. W. G. Love, J. R. Palmer, M. P. Price, R. B. Wardman, J. R. Watson.

The following Pilot Officers are promoted to rank of Flying Officer:—G. E. Agard-Butler, D. C. Harrison (Jan. 13); E. J. Corbally, J. A. Powell, A. D. Selway, E. R. Simonds, R. E. de T. Vintras, W. T. F. Wightman (Jan. 27).

The following are placed on half-pay list, scale B:—Flt.-Lieut. J. M. Glaisher, D.F.C., Feb. 18 to March 9, inclusive; Flt.-Lieut. H. R. D. Waghorn, A.F.C., Jan. 30 to Feb. 24, inclusive. (Substituted for Gazette, Feb. 10.)

Pilot Officer on probation L. E. B. Stonhill takes rank and precedence as if his appointment as Pilot Officer bore date June 27, 1930, immediately following Pilot Officer A. J. McDougall on the gradation list. Reduction takes effect from Jan. 30; Group Captain A. L. Godman, C.M.G., D.S.O., is placed on retired list at his own request (Feb. 25), and is granted permission to retain hon. rank of Air Commodore; Flying Officer E. J. Hill resigns his permanent commn. (Feb. 25); the permanent commn. of Pilot Officer G. F. Goddard is terminated on cessation of duty (Feb. 25).

Stores Branch

206123 Warrant Officer 1st Class S. W. Thomas is granted a permanent commn. as Flying Officer on probation with effect from Jan. 27, and with seny. of Jan. 5; Flt.-Lieut. J. R. Gardiner is placed on retired list (Feb. 19).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron-Leaders: J. S. T. Fall, D.S.C., A.F.C., to No. 7 Sqn., Worthy Down, 10.2.31. D. H. de Burgh, A.F.C., to H.Q., R.A.F., India, New Delhi, 14.2.31. H. P. Lloyd, M.C., D.F.C., to H.Q., R.A.F. India, New Delhi, 24.1.31. C. R. Cox, A.F.C., to H.Q., R.A.F., Transjordan and Palestine, Jerusalem, 4.2.31.

Flight-Lieutenants: P. E. Gwyer, M.B.E., to H.Q., Wessex Bombing Area, Andover, 9.2.31. A. E. Gliddon, D.S.M., to No. 2 Flying Training Sch., Digby, 9.2.31. G. C. O'Donnell, D.F.C., to No. 55 Sqn., Hinaidi, 10.2.31. T. Humble, to H.Q., Iraq Command, Hinaidi, 10.2.31. R. A. A. Cole, to No. 7 Sqn., Worthy Down, 14.2.31. A. G. Pickering, A.F.C., to R.A.F. Depot, Uxbridge, 28.1.31. F. Beaumont, to No. 12 Sqn., Andover, 31.1.31. S. D. Culley, D.S.O., to No. 1 (Indian) Group H.Q., Peshawar, 14.2.31. F. H. Isaac, D.F.C., to No. 39 Sqn., Risalpur, India, 14.2.31. R. E. Hall, to No. 11 Sqn., Risalpur, India, 14.2.31. R. L. Crofton, M.B.E.,

R.Ae.S. and INST. Ae. E.

Official Notice

"Night Air Mails."—Capt. Carl Florman, Managing Director of the A.-B. Aerotransport, Stockholm, will lecture before the Society on "Night Air Mails" on Thursday, March 12, at 6.30 p.m., in the lecture hall of the Royal Society of Arts.

In the course of his lecture, Capt. Florman details the night flying at present in existence, and the probable lines of development. He details the costs of a 24-hour mail service, the great saving in time, and the corresponding increase in trade which will follow. He will detail the organisation necessary both from the point of view of the Post Offices and the air mail companies, the preparation of routes, type of aircraft required, etc. He will state the difficulties not the least of which is the attitude adopted by those not in the aircraft world. In this connection, the following is an extract from his lecture:—

"The four Scandinavian countries, as well as Germany, Belgium and Switzerland, which by making economical sacrifices, have improved the mail service to England, have discovered, to their astonishment, that this improvement was not looked upon with favour by the English Post Office, which, in a memorandum addressed to their Post Office authorities, even requested that the gratuitous and rapid conveyance of mail to England should stop! However, the Postmaster General, though rather unwillingly, has now consented to take delivery of the aeroplane post, although he seems to have omitted to take such measures for the conveyance of mail bags to and from Croydon Aerodrome and the local post offices as are necessary for ensuring the full benefits of an aeroplane mail."

CAPT. J. LAURENCE PRITCHARD,
Secretary.

7, Albemarle Street, W.1.

NEW COMPANIES REGISTERED

HERTS AND ESSEX AERO CLUB, LTD.—Capital £700, in £1 shares. Objects to promote and assist aerial navigation in all forms; to carry on a flying school, club or association, etc. The subscribers are: G. W. Frogley, Cherry Tree Farm, Hoddesdon, Herts, farmer; F. E. Mockford, 9, Buckland Lane, Maidstone, motor engine, and four others. Solicitors: Hamilton, Hill & Son, 2, Old Street, E.C.1.

THANET AVIATION, LTD.—Capital £100 in £1 shares. Objects: To establish, maintain, work and carry on lines of aerial communication and transport by means of aeroplanes, seaplanes, flying boats, airships, and other aerial conveyances, etc. Directors: P. Turner, 13, George Street, Ramsgate. E. Bicknell, 27, Brunswick Street, Ramsgate. J. T. Huddleston, 25, Ellington Road, Ramsgate. J. L. Barnes, 3, Alexandra House, York Terrace, Ramsgate. Solicitors: M. D. Borg, 6, Cecil Square, Margate.

GENERAL AIRCRAFT, LTD., Byron House, 7-9, St. James's Street, S.W.1. Capital £100 in 1s. shares. Objects, to turn to account and deal with any inventions or rights relating to aircraft of all kinds; to manufacture aircraft and components, etc. Directors: W. Escher, Vevey, Switzerland; A. Streuli, 81, Bahnhofstrasse, Zurich, Switzerland, lawyer; C. W. Hayward, Rosedale, Dunstall Road, Wolverhampton, engineer; H. J. Stieger, 54, Bathgate Road, Wimbledon, S.W.19, engineer.

General Aircraft (Parent), Ltd., are entitled to appoint directors while holding 51 per cent. of the issued shares.

Dental Branch

Flying Officer M. J. Pigott, B.D.S., is granted a non-permanent commn. in this rank (Feb. 1).

Legal Branch

W. I. Grantham, M.A., LL.B., is granted a permanent commn. as Flight Lieut. on probation, with effect from and with seny. of Feb. 18.

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following Pilot Officers on probation of Special Reserve are confirmed in rank:—V. O. G. Bell, April 15, 1930. W. A. W. Fitzsimons; April 15, 1930. W. H. Armstrong; Jan. 1. Flying Officer F. W. Hartridge, A.F.C., of Special Reserve, is promoted to rank of Flt.-Lieut.; Jan. 11. Flt.-Lieut. A. H. C. A. Rawson is transferred from Class A to Class C; Feb. 13. Pilot Officer on probation R. E. Cowburn is transferred from Class AA (ii) to Class C; Feb. 15.

The following relinquish their commns. on completion of service:—Flt.-Lieut. R. S. Martin; Jan. 3. Flying Officer T. Brewin; Oct. 24, 1930. Flying Officer W. J. Brown; Dec. 15, 1930. Flying Officer L. W. Beck; Dec. 12, 1930. (Substituted for Gazette Feb. 10.)

AUXILIARY AIR FORCE

General Duties Branch

No. 602 (CITY OF GLASGOW) (BOMBER) SQUADRON.—Flying Officer D. L. Lloyd is transferred to No. 605 (County of Warwick) (Bomber) Squadron; Feb. 9.

A.F.C., to No. 3 Flying Training Sch., Grantham, 18.2.31. R. B. Jordan, to R.A.F. Depot, Uxbridge, 18.1.31. E. C. Barlow, to No. 5 Flying Training Sch., Sealand, 14.2.31.

Flying Officers: J. D. Greaves, to No. 1 Armoured Car Co., Iraq, 10.2.31. C. H. Hockly, to R.A.F. Depot, Uxbridge, 25.1.31. E. S. Finch, to H.Q. Iraq Command, Hinaidi, 10.2.31. J. M. Wells, to No. 55 Sqn., Hinaidi, 10.2.31. P. G. Thomson, to No. 408 Flight, Malta, 14.2.31. J. A. Brown, to No. 5 Sqn., Quetta, India, 14.2.31. E. J. K. Megaw, to No. 28 Sqn., Ambala, India, 14.2.31. D. H. G. Wood, to No. 20 Sqn., Peshawar, India, 14.2.31. C. H. Glover, to No. 5 Sqn., Quetta, India, 14.2.31. D. H. A. Golce-Steel, to No. 31 Sqn., Quetta, India, 14.2.31. B. Paddon, to No. 20 Sqn., Peshawar, India, 14.2.31. H. G. J. Purcell, to No. 28 Sqn., Ambala, India, 14.2.31. A. O. Molesworth, to No. 11 Sqn., Risalpur, India, 14.2.31. R. E. de T. Vintras, to No. 39 Sqn., Risalpur, India, 14.2.31. W. F. Lovering, to Superintendent, of R.A.F. Reserve, Hendon, 8.2.31. T. C. Dickens, to Home Aircraft Depot, Henlow, 4.2.31. J. Sutherland, J. W. Pease, G. H. G. S. Jenkins, and W. D. Butler, all to R.A.F. Depot, Uxbridge, 18.1.31.

AERONAUTICAL PATENT SPECIFICATIONS

(Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

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